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MENTAL DEVELOPMENT AS RELATED TO INSTITUTIONAL RESIDENCE AND EDUCATIONAL ACHIEVEMENT

by

ORLO L. CRISSEY, Ph.D.

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MENTAL DEVELOPMENT AS RELATED TO INSTITUTIONAL RESIDENCE AND EDUCATIONAL ACHIEVEMENT

by

Orlo L. Crissey, Ph.D.

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FOREWORD

In this study Dr. Crissey presents a careful analysis of certain factors related to changes in the rate of mental growth among children in state institutions. Studies conducted in the Station by Wellman and Skeels had already shown that school and home conditions definitely affected this rate, especially at the preschool levels.

While the relationships involved are complex, one or two general trends appear to be reliable and of theoretical and practical significance. Changes in brightness tend to be related to the general IQ level of the group: the relatively dull move upward and the relatively bright show losses. These changes appear when children are transferred from one institutional environment to another. In general, there is presented a picture of accumulative IQ loss associated with long residence in an institution.

GEORGE D. STODDARD

Office of the Director
Iowa Child Welfare Research Station
University of Iowa
November 30, 1936

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CHAPTER I

MENTAL DEVELOPMENT AS RELATED TO INSTITUTIONAL ENVIRONMENT AND EDUCATIONAL ACHIEVEMENT

Statement of Problem

The concept of intelligence as fixed and unmodifiable, or only modifiable within very narrow limits, is fast being replaced by a viewpoint which conceives of intelligence in functional terms. No longer can we say that an early intelligence test rigidly classifies a child for life in terms of mental potentiality. Rather we are finding that changes in functional mental performance are related to environmental differences. Recent studies, especially of children at the younger ages, have shown that these changes may be large in extent and have the appearance of following certain trends in relation to rather general influences. Investigators are unwilling, for lack of objective knowledge, to establish maximum limits within which variation may occur.

Even though mental tests are in need of refinement, they have been found to be fairly effective measuring instruments, sufficiently sensitive to register changes in functional mental level. Increasingly attempts are being made to study factors in the environment which may be related to mental development. As yet only beginnings have been made toward isolating from the tangled, dynamic mass of interrelated factors such gross influences as participation in certain educational systems or home environments.

This study aims to investigate the mental development of children (1) in relation to residence in institutional environments, where the individual has remained in the same general environment or has shifted from an environment designed for children of one mental level to another primarily for individuals of a different mental level, and (2) in relation to individual placement in educational achievement within an institutional environment. Stated in terms of more specific problems for investigation, these purposes are as follows:

1. To what extent is mental development of individuals remaining in the same institutional environment related to the general

mental level of the group, the age of the child, and the length of residence in the institution?

2. What differences in these relationships are seen in environments of differing mental level?

3. Where there has been a major shift of environment from an institution designed for children of one mental level to another primarily for individuals of a different mental level, do individuals tend to follow the pattern set by the mental level of their associates in the new environment?

4. To what extent is mental development related to initial status or change in relative placement in educational achievement within an institutional environment?

Subjects

The subjects for this investigation consist of children resident in four Iowa institutions: the Iowa Soldiers' Orphans' Home at Davenport, the State Juvenile Home at Toledo, the Institution for the Feeble-minded at Glenwood, and the Hospital for Epileptics and School for Feeble-minded at Woodward. The subjects on which individual tests were obtained consist of all children who were resident in these institutions between an initial test and one or more retests. Subjects who were over sixteen years of age at the time of the initial test or retest were eliminated so as to make all intelligence quotients computed on the basis of actual life age. No colored children were included. Epileptics, children with physical anomalies, or cases at the idiot and low imbecile levels were eliminated also.

The following key will be used throughout this study in referring to these institutions:

Institution A: Iowa Soldiers' Orphans' Home at Davenport, Iowa
Institution B: The State Juvenile Home at Toledo, Iowa
Institution X: The Institution for Feeble-Minded at Glenwood, Iowa
Institution Y: Hospital for Epileptics and School for Feeble-Minded at Woodward, Iowa

The following tabulations show the number of cases by institutions, the age range, IQ range, grade, and EQ range in terms of use (1) in individual test analyses and (2) in group test analyses:

Groups	Children*	Age Range, Years	IQ Range
Institution A			
Residents	514	1 to 16	50 to 135
Transfers from X	14	1 to 15	77 to 119

Institution B			
Residents	186	5 to 16	65 to 121
Transfers from Y	3	5 to 11	81 to 84
Institution X			
Residents	32	3 to 16	40 to 99
Transfers from A and B	33	3 to 16	36 to 73
Institution Y			
Residents	54	1 to 16	39 to 94
Transfers from A and B	152	1 to 16	34 to 74

* Children used in individual test analyses.

Institution	Children*	Age Range, Years	IQ Range	Grade Range	EQ Range
A	277	7 to 16	63 to 120	2 to 8	68 to 130
B	138	8 to 15	66 to 123	3 to 8	62 to 127

* Children used in group test analyses.

Thus a total of 988 different children was studied in the individual mental test analyses, while 415 children were involved in group mental and educational test analyses. An individual was used more than once when two or more retest intervals were available.

Tests and Procedure

The Stanford or Kuhlmann Revisions of the Binet Scale were used for all individual tests. The use of the Kuhlmann, however, was limited to those younger cases where a basal mental age of three years could not be obtained on the Stanford. All individual mental tests were administered by well-trained examiners as a part of the co-operative relationships between the Iowa Child Welfare Research Station and the State Board of Control of State Institutions. These tests have been given at varying intervals during the last eight years.

The Kuhlmann-Anderson group test of mental ability and the Unit Scales of Attainment, a general battery of tests of achievement in school subjects, have been given to children in grades three through eight at both Institution A and Institution B. These tests were given in the late spring and summer of 1933, in the fall of 1935, and in the spring of 1936. In each case the Kuhlmann-Anderson test was always given within a short interval from the Unit Scales of Attainment. These tests have been given by the investigator with the additional help of examiners trained in group testing. Intelligence quotients and educational quotients have been computed for each subject.

CHAPTER II

PREVIOUS STUDIES OF MENTAL DEVELOPMENT AS RELATED TO MENTAL LEVEL, AGE, AND RESIDENCE IN INSTITUTIONAL ENVIRONMENT

In the literature of the last twenty years much time has been spent in attempting to defend the constancy of the IQ. It is not the purpose of this discussion completely to review this large accumulation of studies. Good reviews are available by such investigators as Rugg and Colloton (69), Wallin (84), Stenquist (77), Foran (29), Baldwin (6), Burks (14), Nemzek (57), and Pintner (61).

On going through this literature, one is impressed by the fact that the correlation between first and second tests was so universally used to prove constancy. For example, Burks (14), Nemzek (57), and Pintner (61) present tables showing summaries of investigations in which the correlations between tests and retests run from .72 to .95 for both individual and group tests. In these studies such factors as interval between tests, age of subjects, IQ level, range of population, and trends in the direction of change have often been overlooked or assumed to be of little importance. Even after Doll (26) reported that "only 1 subject out of a total of 106 feeble-minded subjects who were below 16 years at the first examination maintains an IQ, which is in accord with the theory the IQ is constant" (p. 118), Terman (79) took Doll's data and computed a correlation of .91. In other words, changes in IQ affected all individuals in the same way, and the relative standing of the individual was not affected.

In certain of the studies that maintain a general constancy of IQ, some qualifications have been made regarding age, interval between tests, and IQ level. In some cases a re-examination of the data presented leads to new implications. A few comments should be made on certain of these studies before passing on to studies of children in institutional environments.

In one of the studies, Burt (16) gives the results on seventy-two children and concludes that the IQ is constant but notes a tendency

for low IQ's to drop with age and with increase of interval between tests.

Gray and Marsden (39) studied retests of 109 children on which a total of 616 comparisons were made. They found no marked difference in variability of tendency with regard to chronological age, mental age, IQ, sex, or interval between tests. However, in looking over their data a trend appears to be indicated by a consistent decrease in a negative median change from IQ's classified above 110 to those below 90. Likewise in terms of interval, one year results in no change; two years in a median IQ change of —1.1; three years —3.3; four years —3.0; five years —6.3. It would appear that both IQ level and interval were operating in terms of direction of change.

Hildreth (42) studied 441 pupils three to eight years of age with IQ's from 80 to 185. A mean variation was found of less than five points. She gives an analysis of the results in the following way:

IQ	Median Difference	Age, Years	Median Difference
80 to 109	3.85	3 to 5	1.77
110 to 124	1.32	6 to 8	1.73
125 to 139	–1.4	9 to 11	.59
Over 140	–5.62	Over 11	.42

The results seem to point toward losses in the upper IQ levels as compared with gains in the lower. There also appears to be greater variability for the younger children. In intervals over three years, greater discrepancies were found between second and first tests. Before accepting these results completely, further investigation should be made of varying intervals between tests (some intervals were very short) and of the training of examiners on the initial tests.

Terman (79) retested 315 normal children five to fifteen years of age over intervals ranging from one to five years and found a median increase of 1.7 in IQ. When differences in retest were tabulated according to IQ at first test and interval between tests, the interval seemed to have no effect upon constancy. The age at the first test seemed to have little effect at most ages, but the group tested between three and six showed slightly more variability than the other groups. He states that it makes little difference as to variability whether the child is bright, average, or dull. These

tests were made on children "in the vicinity of Stanford University," subject, of course, to varying environmental influences.

Basing his conclusions on 468 retests of 170 children over one, two, and four year intervals, Garrison (33) found that the brighter classes seemed to gain more on the average than the duller ones. The lower classes remained about the same or lost a small amount. Gains for the brighter and losses for the duller were larger for the longer intervals.

Such studies as those by Hirsch (43), Wallin (84), Poull (62), Ruggs (70), Rugg and Colloton (69), Rogers, Durling, and McBride (67), Rosenow (68), and others reinforce the traditional view of constancy. Broom (11), Jordan (46), Cattell and Gaudet (17), Pintner (58), and others report similar results for group tests, with increases over shorter intervals largely due to practice effects.

With superior children, Baldwin and Stecher (5) report a gain in IQ proportionate to the number of re-examinations. These children were in a superior school environment, where the IQ level was above the average and where the stimulation to mental effort was probably also very high. Wellman (88) has recently reported on growth of intelligence under differing school environments and shows that in this same environment (although years later) superior children continue to gain. The results of this study and of her earlier studies (86, 87), as well as those of Lincoln (48), confirm the findings of Burks, Jensen, and Terman (15) that the IQ of children with initial IQ's of 140 or above tend to drop. These results are contrary to those of Cattell (18), who found very superior children gaining and inferior children losing. Wellman (88, p. 83) believes, "Differential environmental stimulation would seem to offer a plausible explanation." A recent unpublished master's study by Robertson (66) finds that losses in IQ of very superior children apparently differ with different school environments.

With twenty-six children in special classes, Descoeudres (24) found the IQ upon retest very similar to the first, with a tendency to gain indicated. Berry (9) reports on retests of 390 special class pupils in the Detroit schools. He concludes, in part: "The intelligence quotient of pupils with an original I.Q. from fifty to sixty-nine remained practically constant," while "the intelligence quotient of pupils with an original I.Q. from seventy to eighty-nine

decreased. . . . The decrease in the intelligence quotient was greater among pupils ten to fourteen years of age at the time of the first test than among those six to nine years of age." (p. 729) From his data it can also be seen that the greater the interval between tests, the greater the decrease in IQ.

In 707 behavior problem children Brown (12) finds that the amount of change from one examination to another is small. The fluctuations of behavior children are not significantly greater on the average than those of the normal child, but more than those of the feeble-minded.

Irwin and Marks (44) draw the conclusion that neurotic children present greater variability in IQ than normal children. In 90 per cent of 322 cases, normal children showed IQ's on retests falling within nine points of the initial, while only 53 per cent of the neurotics can be so classed. For the entire normal group of school children a median change of 0.3 points was found.

Numerous studies are available that deal specifically with, or have a bearing on, the mental development of dull and feeble-minded subjects. In some studies the cases come from schools for the feeble-minded. In other investigations no indication is given as to their environmental background.

Probably one of the most thorough-going studies of the IQ of the feeble-minded was that of Kuhlmann (47) at the Minnesota School for the Feeble-minded. Repeated mental examinations were made of 639 feeble-minded over a period of ten years. His conclusions are, in part:

> "The mental ages of the feeble-minded increase with age at a rate proportionate to the degree of mental deficiency. . . . The intelligence quotient decreases with age, and more for the higher than for the lower grades." (Average yearly decline: —2.19 for the border-line; —1.21 for moron; —1.04 for imbecile; —.37 for idiot.) "The rate of decline of the intelligence quotient increases some with age." (p. 222-224)

Kuhlmann believes that the decrease in IQ is a natural consequence of an assumption of a decrease within the yearly increment of mental growth. Thus, their rate of development in mental age is not only slower than that of normal children, but is slower even than the rate required to keep the IQ constant.[1]

---

1 In regard to this viewpoint, Freeman (31, p. 356) has the following comments: "This fact, however, does not create any new problem, nor does it necessarily mean as Kuhlmann infers, that there is an increase in variability in the later ages. The fact

Chipman (19) studied repeated examinations on admissions to the Walter Fernald State School for Feeble-minded at Waverly, Massachusetts. Taking those who were between the ages of six to sixteen at the time of admission, she found that 77 per cent changed 5 points or less, 8 per cent increased more than 5 points, and 15 per cent decreased more than 5 points. Her results indicate:

> "2. The variation found, showed a slight tendency toward decrease in I.Q. rather than increase, in the entire group.
>
> "3. The younger group (those less than 16 at admission) showed more variability than those older, and exhibited a marked tendency toward decrease in I.Q. . . .
>
> "5. The idiots, irrespective of C.A., showed the largest percentage of constant I.Q.'s, the imbeciles and morons progressively smaller.
>
> "6. The majority of inaccurate I.Q.'s fall within the moron group, regardless of C.A." (p. 107)

In a study of 200 defective children attending special schools and tested over a period of eight years, Anderson (1) finds, in part:

> "3. In cases whose Intelligence Quotient is below 50 there is a tendency for the median IQ to remain constant or to gain or lose slightly. The median IQ shows a gain among the younger cases.
>
> "4. All cases with IQ's between 50 and 80 show a decrease in median IQ at any age. The highest initial IQ's show the greatest loss in median IQ after repeated examinations.
>
> "5. In the case of examinations at varying intervals the greatest loss in median IQ was at the interval of five years which was the last examination for all grades of cases. The greatest loss in median IQ was shown by the highest grade [i.e. highest grade subnormals] of cases. . . .
>
> "7. No group of cases showed a marked increase in median IQ." (p. 64)

Similar findings are reported by Henmon and Burns (40) on fifty-nine children with IQ's ranging from 40 to 120, and where the median interval between tests was about two years. Their conclusions indicate that the most significant finding was "the evident tendency with borderline cases, for intelligence quotients to decrease, a tendency most marked in the group whose initial IQ's lie between 60 and 80." (p. 250)

Corroborative evidence is also offered by Woodall (92), who studied the IQ variability of 497 institutionalized feeble-minded

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might be due equally well to a greater curvature in the general line of mental growth than is required for a constant I.Q."

above six years of age who had five or more successive tests. For all cases a mean trend of —0.5 IQ point was revealed. Trends below age sixteen were downward, and those above sixteen were upward. Morons, imbeciles, and idiots were found to have mean trends of —0.4, —0.6, and —0.1 respectively. Explanations were not attempted.

In a series of other studies these general findings are reiterated. Arthur (3) reports that 590 out of 646 cases obtained the same mental classification after retests, but the trend of change was downward. Berry (9) found the feeble-minded making but half a year gain in mental age as compared to a year for normals. Doll (26) indicates that only one out of 106 feeble-minded subjects retested "maintains an I.Q. which is in accord with the theory the I.Q. is constant." (p. 118) Prouty (64) retested 1,136 feeble-minded cases at Wrentham State School, Wrentham, Massachusetts, and found, irrespective of age and mental level, a tendency for a slight decrease in IQ. Minogue (55) reports that after retests on 441 feeble-minded at Letchworth Village, Thiells, New York, "The variation that appeared tended to be a loss rather than a gain." (p. 758) Finally, Davenport and Minogue (21), as a part of a developmental series, measured seventy boys on repeated tests. They conclude that ". . . in these mentally inferior children, there is, despite repetition of tests, a real diminution of the IQ in successive years, amounting to about 2 points per year." (p. 501-502)

Studies of mental development of children in orphanages or institutions for dependents are few in number. Studies which consist of surveys of institutional populations, such as those by Cobb (20), Fernald (28), Gordon (38), Terman and Wagner (78), Viteles (83), Wile (89), and the State Board of Control of California (2), have pointed out that institutional populations are mentally retarded as compared to normal populations, but beyond this these studies are of little further scientific importance.

The study of the variability in IQ of a group of dependent children in institution and foster home by Lithauer and Klineberg (50) is an attempt to obtain further data regarding the influence of change of environment on the Binet scores. One hundred twenty children were tested before and after transfer to a carefully maintained Hebrew orphanage from supposedly "inadequate" homes. The subjects ranged in age from three to fourteen. Intervals between tests ranged from three to fifty-seven months. The con-

clusions of the authors are: (1) Improvement of environment has a favorable influence on IQ. The mean improvement was 5.9 points, the median 6.3 points. (2) No relationship was found between change in IQ and period of residence. (3) There is a negative correlation between age at first test and improvement in IQ. The authors suggest that this may mean that the environment has more influence on the younger child, or that there are defects in the lower levels of the scale. (4) A few months may make marked improvements in the IQ. These findings, of course, are dependent upon the validity of the first tests.

Jones and Carr-Saunders (45) have studied the relation between intelligence and social status among orphan children in England. The subjects, 700 or 800 from eight industrial schools or orphanages, were given the Simplex group intelligence tests. The pupils were classified by schools and seem to show a differential effect of environmental factors on different social classes. With length of residence, the differences tend to decrease; the average IQ of one class of children is seen to increase, and that of another class of children to decrease. Continued association then brings greater likenesses in mental ability.

Schmitt (72) studied 100 children between the ages of four and sixteen in two Wurzburg orphanages. The Binet 1911 scale was used. All the children had originally come from very poor home environments. The children were divided into groups, each covering a range of two years' chronological age. No significant difference was found in these groups between those who had been in institutional residence the longest time and those who had been there the shortest. The author admits that the small numbers prevent unquestionable conclusions, but believes that any "large influences" would be revealed if present. Selective influences tending to cover up environmental differentials were not controlled.

Reymert and Frings (65) have presented some preliminary data regarding changes in mental rating as related to residence in Mooseheart, a home for dependents of members of the Loyal Order of Moose Lodge. Percentile scores on the Otis group test are given in terms of number of years at Mooseheart. There seems to be a definite trend upward in IQ's as measured by group tests of children at Mooseheart with accumulation of years of stay. Evidence is lacking as to the control of selective factors operating in terms of differing types of admissions over a period of years. The authors

state that analyses are now being made on the basis of individual Binets.

In the study of twins and orphans carried on by Wingfield and Sandiford (90) no significant difference was found between younger and older twins in mental traits. Identical twins resembled each other more than fraternal twins. Orphan children living together over long intervals of residence in the same environment were no more alike in general intelligence than unrelated children compared at random.

One of the most extensive investigations of the mentality of orphans is the study by Davis (22) on orphan children in six Texas institutions. In all, 1,051 orphanage children were tested on the Dearborn and Haggerty group tests of intelligence. For comparative purposes 504 children between grades two and eight in the Waco, Texas, schools were also tested. Orphanage children were shown to be mentally retarded as a group. The results indicate that the institutional life provided by an orphanage has no effect in causing orphanage siblings to resemble each other any more closely than public school children who have been reared in homes. In fact, the correlation coefficients of orphanage siblings are even lower than those for public school children. "... if institutional life, as measured by length of residence, has any measurable effect, it would be made manifest among these children who as a group, have experienced common environments for an appreciable length of time." (p. 147)

Gordon (37) used the same approach in analyzing 335 individual examinations of children in California orphanages. The IQ's of brothers and sisters of all children examined were correlated, and a coefficient of .53 was obtained. From this it was concluded that a higher degree of relationship existed between siblings than between unrelated pairs and the difference ascribed to heredity.

In both of these studies many data are needed in order to be more convincing. The extent to which the resemblances are due to early home influences and the extent to which the differences are due to varying environmental stimulation before and after admission to the institutions remain for speculation. In Davis' study, if families are kept together, why shouldn't there be a stimulation from within the institution toward greater likenesses? The fact that the correlation in Davis' study is lower for the orphan siblings than for the public school pairs may be an argument in

favor of attempting to discover the causes of differences in the institutional environment. All of these questions are clouded by inadequate data as to IQ levels involved, length of residence, age of test, etc.

Studies of mental development of children before and after transfer from one institution to another are not available in the literature. That changes occur when children transfer from one school system to another has been shown by Wellman (88). Barrett and Koch (7), Wellman (87), Skeels (75), and Driscoll (27) have reported gains in IQ for children attending preschool, but Goodenough (35) concludes that no real improvement takes place. The so-called Stanford and Chicago studies reported in the *Twenty-Seventh Yearbook of the National Society for the Study of Education* (56) agree that environment is operative, but disagree on the extent of influence. The Chicago section gives more status to environmental effects. Children placed in better foster homes gain more in IQ points than those in poorer homes, and early adoption increases the possibilities of a gain. Skeels' (76) recent study considerably reinforces this viewpoint. These changes cannot be relegated to the realm of "pseudo-changes due to external conditioning factors." Unless the individual was placed in a stimulating situation, or the external depressants released, it is possible that mental retardation or deficiency may have become permanent.

Summary and Conclusions

Previous studies of mental development as related to mental level, age, and institutional level can be summarized in the following statements:

1. Numerous studies have attempted to show that the IQ remains constant, if constancy is defined as variability within an average of 5 IQ points or a fairly high correlation between initial test and retest. This point of view is taken by Burt, Terman, Ruggs, Hirsch, Poull, Rugg and Colloton, Rogers, Durling and McBride, Rosenow, Broom, Jordan, Cattell and Gaudet, Pintner, Gray and Marsden, Hildreth, Garrison, and others. Gray and Marsden, and Hildreth, however, present data showing tendencies toward some losses in the upper levels and toward gains in the lower ones. Garrison reports that the higher levels gained, while the lower levels lost. Terman and Hildreth suggest greater variability for younger children than for older. Terman concludes that IQ level and intervals between tests are of no importance, but Burt, Hildreth, and Gray and Marsden show that decreases or greater discrepancies occur for longer intervals between tests.

These studies exhibit the results of starting from a hypothesis of con-

stancy. The results of correlating initial tests and retests were presented as if environmental influences were unimportant. Furthermore, a certain trend has been shown toward studying general populations, irrespective of such items as age, mental level, range of talent, intervals between measurements, and direction of change. These were overlooked, or assumed to be of little importance.

2. Superior children have been found by Baldwin, Wellman, and Cattell to gain in IQ, but Wellman and Robertson find growth related to differential school environments. In disagreement with Cattell, the studies of Wellman, Lincoln, and Burks, Jensen, and Terman find very superior children with IQ's over 140 tending to lose in IQ. It is possible to advance the hypothesis in these cases that their environment does not demand development of a quality to maintain their high level.

3. Children in special classes were found by Berry to decrease in IQ in the borderline classification and to remain almost constant in the moron group. Decreases were greater for older ages and for longer intervals between tests. Descoeudres' small group of cases remained very similar.

4. Behavior problem cases have been found by Brown to be more variable than feeble-minded subjects, but not more than normals. Irwin and Marks noted that neurotics are more variable than normals, as would be expected.

5. That feeble-minded children tend to lose in IQ has been shown by Kuhlmann, Chipman, Anderson, Henmon and Burns, Woodall, Arthur, Berry, Doll, Prouty, Minogue, Davenport and Minogue, and others. In most of these studies differential losses have been reported for groups of varying mental levels, the higher levels losing more in relation to the lower levels. Rate of decline was found by Kuhlmann to increase with age. According to Chipman the younger group tends to show greater variability. In none of these studies have the investigators studied changes in relation to the average mental level of the group, nor have children with the same IQ's been studied in relation to environments of differing mental levels.

6. In studies involving orphanage and dependent children the fact of institutional residence is usually stated, but often the population has not been described. In this area a group of survey studies adds little to our knowledge, except that orphanage children appear to be somewhat retarded as groups. That the improved environment of the institution was favorable to mental development is the conclusion of Lithauer and Klineberg. These authors believed that younger children are affected more by the environment than are older ones. Lithauer and Klineberg agree with Schmitt that the interval of residence showed no relationship to change, but Jones and Carr-Saunders find length of intervals of residence related to greater similarity of unlike mental levels. Reymert and Frings find increases in mental status related to increases in length of residence.

Wingfield and Sandiford, Gordon, and Davis have attempted to show the relative influences of heredity and environment by comparing correlations of IQ of orphan siblings with children paired at random. Wingfield and Sandiford, Gordon, and Davis agree in concluding that institutional residence has no effect in causing orphanage children or orphanage siblings to be nearer alike in general intelligence than unrelated children brought

up in their own homes. The studies, however, have not taken into account possible environmental influences operative either before or after admission to the institution. A correlation technique irons out certain trends and individual changes. Descriptive data in terms of the population and the environment are meager in these investigations.

7. Finally, it is not a question of whether changes are brought about by different environments, but rather of what changes occur in relation to a certain environment. The age of the child, the period of residence, his placement in relation to the mental levels of his associates, and the nature of the environment—these are the important differentials to be studied.

CHAPTER III

MENTAL DEVELOPMENT AS RELATED TO INSTITUTIONAL RESIDENCE AND CERTAIN LEVELS OF MENTAL ABILITY

Specific Problems

Some recent studies of preschool and school age children by Wellman (87) and Skeels (75) have shown that groups of individuals in the mental levels below the central tendency of a population appear to gain on retests, while those in the upper levels tend to gain less or to lose in IQ. The factors responsible for these phenomena are difficult to understand. Do gains (or smaller losses) at the lower IQ levels of a population mean that the average sets the "stimulation level" for the group, tending thus to encourage those in the lower IQ levels to greater attainment while those in the upper categories are not challenged to attain their potentialities to a similar degree? Do children develop only as the environment demands development?[2] Stated from another angle, does an environment "geared" more to the average child tend to stimulate more highly those individuals below the central tendency of the group by demanding more of them, and fail to stimulate similarly those above the average? If the environment fails to stimulate children to a large measure of development, rather allowing them to function much below their best efforts, does the IQ tend to decrease? Or, vice versa, can a gain be expected if they function at a high level of attainment? Further, what is the importance of the individual's relationship to smaller groupings, such as school grade, within the general environment? Do environments of differing mental levels show differences in these relationships?

The age of the child, or the length of residence in an environment, may have important relationships to the accentuation of these trends. It is quite possible that the environment may be more stimulating to a child at one stage of development than another.

2 Sherman and Key (73), in their study of children in an isolated Virginia community explain general decreases in intelligence quotients as due to an environment which does not demand greater development.

Wellman's (86, 87) studies of children of the preschool age have shown that large changes take place in a stimulating preschool environment. Skeels' (76) study of children placed in foster homes before six months of age indicates that these children show an average mental level corresponding to the better environmental conditions of the foster home, when tested from twelve to thirty-six months after placement. Length of residence in certain environments may be an important factor in mental development. It is also possible that continued performance at certain levels of mental achievement results in cumulative effects on mental growth.

It should be borne in mind that institutional residence in itself to some extent controls or equates numerous factors in the general environment. Children go to the same school, have the same recreational and entertainment advantages, and are exposed to a similar life together in the cottages. Routines remain fairly constant from day to day. Such factors, held more or less constant, present a different situation from that of most children, who come from different homes, even though they go to the same school and grade.

Procedure

In this chapter the mental development of children is studied in relation to certain levels of mental ability, age, and intervals of institutional residence. Children from two state homes for dependents and two state schools for the feeble-minded are used in the analyses. In the two state homes for dependents the average mental level is that of the dull-normal child, ranging from IQ averages of 85 to 90, depending upon population changes. Thus, these institutions may be spoken of as having primarily children of normal and dull-normal ability. In terms of social participation, they may be referred to as presenting environmental stimulation or demands at the level of the dull-normal classification. On the other hand, the schools for the feeble-minded are maintained for children of a lower level. Here the demands are at the level of the feeble-minded. In terms of group associations, the mental stimulation is probably at the level of the low or middle moron.

The findings are logically divided into three major areas: (1) where the child remains in the same general environment, (2) where there has been a major shift of institutional environment, and (3) where children of the same mental levels reside in differing environments. Thus, data dealing with a certain factor, such as

mental status at the time of the initial examination, have been assembled from institutions designed for children of differing mental levels, but the results will be considered in relation to a definite institutional environment.

Findings

Mental Development of Children Remaining in the Same General Institutional Environment

In this section the mental development of children remaining in the same institution is discussed in relation to initial mental level, age, and intervals of residence.

Mental Development as Related to Initial Level of Mental Ability.—In Table 1 data are presented on the relation of initial mental classification to mental development, disregarding age and interval of residence. Table 1 presents changes in IQ of children resident in the two homes for dependent children according to 10 point intervals. These tables are based on the results of retests using the Stanford and Kuhlmann Revisions of the Binet Scale. In these environments, where the mental level is primarily that of the dull-normal child, individuals classed as borderline and moron tend to remain constant or to show a slight gain. Children falling in the normal and superior classifications show consistent losses. Although not all the means of the various IQ levels are significantly greater than zero, a trend is indicated for losses to be dependent upon the extent of deviation from the average of the group. In Institution A, especially, mean losses increase in progression from the IQ level 80 to 89 through that of 120 to 129, and the difference between the extremes of this series is significant. In the levels below 80 to 89, the pattern of gains shows no consistent trend toward increase.

In regard to mean change there is a tendency toward increase with higher IQ levels, but only in Institution A is the difference between the extremes of this progressive series statistically significant. Differences between the means of the same IQ level in the two institutions are not large enough to be significant except at the IQ level 120 to 129. Mean changes range from 5.7 to 17.4 IQ points for the population of Institution A and between 4.9 and 7.7 points for Institution B.

Similar data, using the Kuhlmann-Anderson group tests, likewise show the tendency of the lower levels to gain and the higher

ones to lose. Reference to Table 1 discloses that the dividing point between the gains and the losses is approximately 90 IQ. In both institutions there is a progression of gains and losses, dependent

Table 1

Change in IQ as Related to IQ Level of Children in Institutions A, B, X, and Y on the Kuhlmann or Stanford Revisions of the Binet Tests and Kuhlmann-Anderson Test

IQ Levels	Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Kuhlmann or Stanford Binet Tests							
Institution A							
40 to 49	4	.8	7.6	3.8	6.3	4.4	2.2
50 to 59	18	1.1	9.0	2.1	7.6	4.9	1.2
60 to 69	80	3.3	9.6	1.1	7.4	7.0	.8
70 to 79	250	.3	7.3	.5	5.8	4.4	.3
80 to 89	266	−2.2	8.8	.5	6.8	5.9	.4
90 to 99	182	−4.2	9.9	.7	7.8	7.4	.6
100 to 109	83	−5.7	10.7	1.2	9.4	7.7	.8
110 to 119	38	−6.7	11.7	1.9	11.9	6.3	1.0
120 to 129	5	−17.4	4.8	2.1	17.4	4.8	2.1
130 to 139	3	−5.0	9.9	5.7	5.7	9.6	5.5
Institution B							
60 to 69	24	2.3	5.6	1.1	4.9	3.5	.7
70 to 79	77	1.6	6.7	.8	5.2	4.5	.5
80 to 89	88	.4	7.3	.8	5.9	4.2	.5
90 to 99	57	−3.6	7.3	1.0	6.7	4.6	.6
100 to 109	24	−4.0	8.4	1.7	7.7	5.2	1.1
110 to 119	1						
120 to 129	10	−1.7	7.5	2.4	6.5	4.1	1.3
Institution X							
40 to 49	4						
50 to 59	10	− .7	5.7	1.8	4.5	5.3	1.7
60 to 69	12	−4.4	5.7	1.6	5.3	4.9	1.4
70 to 79	4						
80 to 89	7	−7.4	6.7	2.6	8.0	6.1	2.3
90 to 99	3						

Table 1 (Continued)
Change in IQ as Related to IQ Level of Children in Institutions A, B, X, and Y on the Kuhlmann or Stanford Revisions of the Binet Tests and Kuhlmann-Anderson Test

IQ Levels	Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution Y							
30 to 39	1						
50 to 59	24	−4.1	5.2	1.1	5.5	3.6	.7
60 to 69	29	−4.5	3.8	.7	4.9	3.2	.6
70 to 79	7	−3.9	5.8	2.2	6.4	2.7	1.0
80 to 89	4						
90 to 99	1						
Kuhlmann-Anderson Tests							
Institution A							
60 to 69	18	7.9	5.8	1.4	8.1	5.6	1.3
70 to 79	85	3.2	6.6	.7	5.6	4.7	.5
80 to 89	174	2.0	6.0	.5	4.9	3.9	.3
90 to 99	172	1.0	6.0	.5	4.8	3.7	.3
100 to 109	68	−1.5	6.8	.8	5.2	4.6	.6
110 to 119	30	− .1	9.5	1.7	7.2	6.1	1.1
120 to 129	6	−6.3	7.4	3.0	7.7	6.0	2.4
Institution B							
60 to 69	9	4.0	2.5	.8	4.0	2.5	.8
70 to 79	46	3.2	4.7	.7	4.5	3.4	.5
80 to 89	64	2.0	5.8	.7	5.0	3.5	.4
90 to 99	62	− .8	6.7	.9	5.7	3.7	.5
100 to 109	36	.3	6.8	1.1	5.1	4.5	.8

upon the extent of deviation from the average of the group, and the differences between the extremes of these series are significant.

The institutions do not differ as to mean change at various IQ levels on the group tests. For the population of Institution A the average changes range from 4.8 to 8.1 IQ points, while those of Institution B range from 4.0 to 5.7.

In the section of Table 1 dealing with residents at the two in-

stitutions for the feeble-minded, one finds a consistent picture of loss for children in both institutions. In neither institution are the differences between the mean loss of different IQ levels significant, although on first appearance there seems to be a trend at Institution X for losses to increase with progressively higher mental levels. Between different mental levels the differences are not large enough to be statistically significant. Changes at Institution X range from 4.5 to 8.0, while at Institution Y they range from 4.9 to 6.4 IQ points.

Mental Development as Related to Level of Mental Ability for Different Age Groupings.—It is of interest to see if any trend of differences can be discovered between subjects of similar mental ability but of varying ages. Intervals of residence are thus disregarded. Data bearing on this problem are available in analyses on the basis of initial IQ levels, taken by age groupings.

Upon classifying the respective individual and group test data for Institutions A and B groups by age of first test, it was found that there were insufficient cases at the various yearly age levels. Consequently it was decided to combine the material into four-year groupings. Table 2 presents these data for the ages under four years, five to eight years, nine to twelve years, and thirteen years and over. It was deemed inadvisable similarly to combine the Kuhlmann-Anderson tests, since it was seen in the above section that the group tests followed the pattern of the more reliable individual tests.

It can be seen in Table 2 that the trend indicated above for all ages is found, in the main, to be consistent for four-year age groupings. No significant age differences were found for either institution.

The numbers of residents in the schools for the feeble-minded on whom retests are available are too small to allow refinement according to mental levels and ages combined. The material on all ages has been discussed above; classifications based on age alone will be taken up later.

Mental Development as Related to Intervals of Institutional Residence.—In order to study the relationship of mental development to length of residence in an institution, data were compiled for all ages in terms of varying intervals. Table 3 concerns children in residence in the two state homes for dependents, classified as to intervals of residence without regard to age and mental level.

Table 2
Net Changes in IQ as Related to IQ Level of Children in Institutions A and B Taken by Four-Year Age Groupings

IQ Levels	Institution A				Institution B			
	Children	Mean	Standard Deviation	Standard Error of Mean	Children	Mean	Standard Deviation	Standard Error of Mean
1 to 4 Years								
50 to 59	5	4.2	6.2	2.8				
60 to 69	15	9.6	10.8	2.8				
70 to 79	51	.6	8.4	1.2				
80 to 89	52	−4.0	12.0	1.7				
90 to 99	60	−6.5	13.6	1.8				
5 to 8 Years								
60 to 69	24	2.2	12.5	2.6				
70 to 79	64	2.3	7.3	.9				
80 to 89	89	− .6	7.4	.8	13	− .9	8.4	2.3
90 to 99	56	−2.8	6.7	.9	11	−3.3	6.8	2.1
100 to 109	32	−3.5	9.6	1.7				
110 to 119	8	−3.9	12.8	4.5				
120 to 129					7	.3	7.2	2.7
9 to 12 Years								
70 to 79	98	−1.6	6.5	.7	31	.3	5.7	1.0
80 to 89	98	−3.1	7.8	.8	53	− .9	6.6	.9
90 to 99	62	−3.5	7.5	1.0	31	−4.2	7.7	1.4
100 to 109	26	−1.4	6.8	1.3	19	−1.9	7.9	1.8
110 to 119	5	−6.0	14.1	6.3				
13 Years and Over								
60 to 69	12	1.7	4.7	1.4	9	3.4	5.6	1.9
70 to 79	29	.8	5.3	1.0	32	3.0	6.0	1.1
80 to 89	22	−1.8	7.8	1.7	13	2.2	6.6	1.8
90 to 99					5	−6.6	3.0	1.3
100 to 109	5	−6.2	6.7	3.0				

In both institutions there is a slight trend of loss with residence. No significant differences between adjacent intervals were found. A tendency is indicated for losses to increase during intervals of residence ranging from a year to three years, six months. For

Table 3
Change in IQ of Children in Institutions A and B Over Varying Intervals of Residence

Interval of Residence				Children	IQ at Beginning of Interval			Net Changes in IQ			Changes in IQ Disregarding Sign		
Years	Months	Years	Months		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution A													
0	0 to 0	5		45	84.0	16.2	2.4	.4	8.3	1.2	6.6	5.0	.8
0	6 to 0	11		138	81.7	14.0	1.2	– .2	10.7	.9	7.5	7.6	.7
1	0 to 1	5		189	81.4	12.7	.9	–1.2	8.7	.6	6.7	5.6	.4
1	6 to 1	11		185	84.1	13.9	1.0	–1.9	9.4	.7	6.9	6.6	.5
2	0 to 2	5		156	86.5	13.3	1.0	–2.7	9.7	.8	7.5	6.7	.5
2	6 to 2	11		86	91.3	13.2	1.4	–3.2	9.4	1.0	7.9	6.1	.7
3	0 to 3	5		37	87.1	13.0	2.1	–5.4	9.5	1.6	9.3	5.8	1.0
3	6 to 3	11		22	87.9	17.8	3.8	–3.9	9.2	2.0	8.4	5.5	1.2
4	0 to 4	5		39	84.4	9.9	1.6	–3.8	8.0	2.1	6.9	5.6	1.5
4	6 to 4	11		16	86.6	7.3	1.8	–1.2	9.1	2.3	7.7	5.0	1.3
5	0 to 5	5		4	86.5	7.4	3.7	–8.5	5.0	2.5	8.5	5.0	2.5
5	6 to 5	11		3	86.7	3.6	2.1	–5.3	3.3	1.9	5.3	3.3	1.9
6	0 to 6	5		10	77.8	8.6	2.7	–3.1	10.5	3.3	10.1	4.4	1.4
Institution B													
0	6 to 0	11		28	81.6	17.5	3.3	2.4	4.0	.8	3.6	3.0	.6
1	0 to 1	5		95	79.7	10.9	1.1	1.7	6.7	.7	5.5	4.2	.4
1	6 to 1	11		53	87.0	11.3	1.6	–2.1	7.2	1.0	6.0	4.5	.6
2	0 to 2	5		70	89.3	12.2	1.5	1.4	8.3	1.0	6.9	4.9	.6
2	6 to 2	11		9	102.0	16.7	5.6	– .4	7.4	2.5	6.7	3.2	1.1
3	0 to 3	5		20	89.0	18.6	4.2	–4.9	7.8	1.8	7.6	5.3	1.2
3	6 to 3	11		8	89.3	15.5	5.5	–2.1	5.9	2.1	5.4	3.3	1.2
4	0 to 4	5		2	80.0	7.0	5.0	–2.5	2.5	1.8	2.5	2.5	1.8

Table 4
Change in IQ of Children in Institutions A and B Over Varying Intervals of Residence*

Interval of Residence		Children	IQ at Beginning of Interval			Net Changes in IQ			Changes in IQ Disregarding Sign		
Years	Months		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution A											
0	7	200	89.6	14.3	1.0	2.2	5.5	.4	4.7	3.7	.3
2	3	193	89.3	14.8	1.1	.2	7.0	.5	5.5	4.3	.3
2	11	160	90.7	15.0	1.2	1.8	7.5	.6	5.8	5.1	.4
Institution B											
0	7	106	89.5	11.6	1.1	2.0	5.2	.5	4.5	3.2	.3
2	5	44	91.4	10.5	1.6	−1.1	6.8	1.0	5.6	4.0	.6
2	11	51	86.7	11.4	1.6	1.7	7.4	1.0	6.2	4.4	.6
3	6	16	82.3	10.2	2.6	.4	4.6	1.2	3.9	2.6	.6

* Kuhlmann-Anderson Tests.

Institution A the range is from —.2 to —5.4 IQ points; for Institution B the range extends from 1.7 to —4.9 points.

The pattern of variability is much the same in both institutions, except for intervals of six months to one year, where Institution B shows a smaller mean change.

Table 4 presents the data for the orphanage groups based on the Kuhlmann-Anderson group tests over three respective intervals of residence. As between these two homes for dependents, no differences were found in respect to corresponding periods of institutional residence. A gain of about two points was found over the two years, eleven months interval for each institution. The difference between the means for the two years, five months interval and the two years, three months interval, for Institution A, amounts to 1.6 points, and is statistically significant. For Institution B, the difference is 2.8 points, with a critical ratio of 2. Thus there are 94 chances in a hundred that a difference greater than zero exists between the mean net change of the two years, five months interval and the two years, eleven months interval for Institution B. Seemingly, this practice effect has entered into the two years, eleven months and three years, six months intervals as a more or less constant error of about two points in favor of gain. No significant differences were found between the mean changes of the different intervals or between institutions.

By way of comparison, let us now look at the relationship between length of interval and change in IQ for feeble-minded subjects. The following tabulation shows that there are no significant differences between net changes in IQ over intervals ranging from six months to three years, and those over intervals of from one to two years, or two to three years:

Interval of Residence					Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
Years	Months		Years	Months		Mean	S.D.	$S.E._M$	Mean	S.D.	$S.E._M$
						Institution X					
1	0	to	1	11	9	−4.3	4.4	1.5	4.3	4.4	1.5
2	0	to	2	11	23	−5.2	6.6	1.4	6.7	5.1	1.1
0	6	to	2	11	37	−4.0	6.6	1.1	6.0	4.8	.8
						Institution Y					
1	0	to	1	11	39	−3.7	7.2	1.2	6.0	5.6	.9
2	0	to	2	11	18	−5.1	5.2	1.2	6.3	3.6	.9
0	6	to	2	11	64	−3.9	6.6	.8	5.9	4.9	.6

Table 5
Change in IQ of Children in Institution X with Long Intervals of Residence

Age Groups	Children	Interval of Residence*			IQ at Beginning of Interval			Net Changes in IQ			Changes in IQ Disregarding Sign		
		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
6 years and under	8	126.0	17.9	6.3	71.9	12.9	4.6	–13.1	4.8	1.7	13.1	4.8	1.7
7 to 9 years	7	103.0	19.7	7.5	63.3	11.9	4.5	–13.3	10.8	4.1	15.6	7.1	2.7
Both age groups	15	115.3	22.0	5.7	67.9	13.2	3.4	–13.2	8.2	2.1	14.3	6.1	1.6

*In months.

The institutions present a consistent picture of losses ranging between —3.7 and —5.2 IQ points. Mean changes hover between 5 and 6 points.

By comparing the above tabulation and Table 3 the feeble-minded subjects can be studied in relation to the orphanage children. No significant differences in net change in IQ are found when comparable intervals are compared.

For long intervals of residence greater average losses occur for residents at Institution X. Table 5 shows the averages for eight children under six years of age, for seven children between seven and nine years, and for all combined. Over intervals of residence averaging ten years, six months, eight children with mean initial IQ's of 71.9 show a mean loss of —13.1 IQ points. The variability of gains or losses was within 5 points of the mean loss. Likewise, seven children between seven and nine years of age over somewhat shorter intervals (average, eight years, seven months) show a significant loss of —13.3 points. There was a larger standard deviation of losses for this group than for the younger one. The average IQ of the latter group was 63.3, or about 8 points lower than that of the first group. Taking both groups together and making an average length of residence nine years, seven months, a significant loss of —13.2 IQ points is seen. Certainly, individuals classed as high moron and borderline show substantial losses over long periods of residence in an institution for the feeble-minded.

Mental Development as Related to Intervals of Residence for Different Age Groupings.—It is quite possible that children of varying ages react differently to, or are influenced to different extents by, longer and shorter intervals of institutional residence.

In accordance with our earlier findings, it was decided to refine the analyses no further than four-year age groupings for the orphanage children. Table 6 presents the data on Institutions A and B respectively.

For children under four years of age at the time of the initial test there is a tendency towards loss at each interval of residence in Institution A. Only at intervals between one year and one year, six months, however, are the losses reliable statistically. Differences between different intervals of the series are not significant and the variabilities of gains and losses run large.

At the other age groupings no institutional differences are seen for the three age groups. For ages five through eight at Institution

Table 6
Net Changes in IQ of Children in Institutions A and B Over Varying Intervals of Residence as Taken by Four-Year Age Groups

Interval of Residence				Institution A				Institution B			
Years	Months	Years	Months	Children	Mean	Standard Deviation	Standard Error of Mean	Children	Mean	Standard Deviation	Standard Error of Mean
1 to 4 Years											
0	0	to 0	5	22	−1.0	8.8	1.9				
0	6	to 0	11	64	−3.2	13.9	1.7				
1	0	to 1	5	44	−6.2	10.4	1.6				
1	6	to 1	11	26	−4.4	17.4	3.4				
2	0	to 2	5	22	− .8	9.1	2.0				
3	0	to 3	5	5	−7.6	13.2	5.9				
5 to 8 Years											
0	0	to 0	5	10	2.7	6.6	2.1				
0	6	to 0	11	34	1.9	7.0	1.2				
1	0	to 1	5	31	3.0	7.2	1.1	10	−2.6	9.0	2.8
1	6	to 1	11	50	−1.6	7.9	1.1	5	− .4	4.7	2.1
2	0	to 2	5	56	−1.2	10.3	1.4	6	1.2	11.3	4.6
2	6	to 2	11	38	−4.2	8.5	1.4				
3	0	to 3	5	11	−7.2	5.5	1.7				
3	6	to 3	11	5	− .8	10.8	4.8				
4	0	to 4	5	8	−3.3	4.5	1.6				
9 to 12 Years											
0	6	to 0	11	19	3.1	3.7	.9				
1	0	to 1	5	70	1.3	7.4	.9	37	.6	6.5	1.1
1	6	to 1	11	83	−2.2	7.1	.8	31	−4.2	5.8	1.0
2	0	to 2	5	54	−3.0	7.9	1.1	44	−1.7	8.1	1.2
2	6	to 2	11	35	−3.6	7.7	1.3				
3	0	to 3	5	11	−2.9	10.5	3.2	10	−1.5	7.3	2.3
4	0	to 4	5	8	−5.5	8.9	3.2				
13 Years and Over											
0	6	to 0	11	11	2.1	4.7	1.4	6	1.2	2.0	.8
1	0	to 1	5	30	− .3	6.7	1.2	39	2.6	5.7	.9
1	6	to 1	11	20	1.1	5.8	1.3	14	.4	9.0	2.4
2	0	to 2	5	13	−4.6	6.0	1.7	5	−9.2	2.3	1.0

Table 7
Change in IQ of Children in Institutions X and Y According to Age at First Test and Intervals of Residence
(Nontransfers)

Interval of Residence				Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
Years	Months	Years	Months		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution X										
6 Months to 6 Years, 5 Months										
0	6	to 2	11	5	2.2	8.3	3.7	7.8	3.5	1.6
6 Years, 6 Months to 9 Years, 5 Months										
2	0	to 2	11	10	−6.4	8.2	2.6	8.2	6.5	2.0
0	6	to 2	11	17	−5.7	7.1	1.7	7.0	5.9	1.4
9 Years, 6 Months to 12 Years, 5 Months										
2	0	to 2	11	6	−3.7	2.6	1.0	4.0	2.0	.8
12 Years, 6 Months to 15 Years, 5 Months										
0	6	to 2	11	8	−4.6	3.7	1.6	4.6	3.7	1.6
Institution Y										
6 Months to 6 Years, 5 Months										
0	6	to 2	11	8	−2.9	12.1	4.3	8.9	8.7	3.1
6 Years, 6 Months to 9 Years, 5 Months										
1	0	to 1	11	9	−1.1	5.0	1.7	4.2	3.0	1.0
0	6	to 2	11	12	−2.0	5.7	1.7	4.5	4.0	1.2
9 Years, 6 Months to 12 Years, 5 Months										
1	0	to 1	11	18	−2.9	6.8	1.6	5.6	4.8	1.1
2	0	to 2	11	10	−6.0	2.7	.9	6.0	2.7	.9
0	6	to 2	11	28	−4.0	5.9	1.1	5.7	4.2	.8
12 Years, 6 Months to 15 Years, 5 Months										
1	0	to 1	11	10	−5.8	3.4	1.1	6.0	3.1	1.0
0	6	to 2	11	16	−5.8	3.2	.8	5.9	3.0	.8

A a tendency may be noted for small average gains at the shorter intervals of residence, changing to increasing losses in intervals over one year, six months. A difference between the extremes of this series is statistically significant. For the same ages at Institution B, no changes occur for intervals up to two years, six months.

At ages between nine and twelve, the two institutions show smaller, but significant, losses between intervals of residence ranging from one year, six months to two years, than for periods falling within the preceding six months range. At Institution A, alone, gains are shown for the shorter intervals changing to losses in periods of residence between one year, six months and two years, six months. Differences between the shorter intervals, where mean gains are shown, and intervals ranging from one year, six months to three years are toward small, but significant losses. Over one year, six months, mean gains or losses are inconsistent.

Finally, for the two homes for dependents, we find the older ages remaining practically constant. An exception occurs for five cases in Institution B with intervals of residence ranging between two years and two years, six months, where a 9 point loss is registered. In the main, the variability of gains or losses is smaller for these older ages.

Turning now from the orphanage groups to those in schools for the feeble-minded, Table 7 shows changes in mental development in relation to age and intervals of residence. For the few cases under six years of age no changes greater than zero can be found for periods of residence under three years. At all age levels, for the same interval of residence, no differences in net losses are seen between Institutions X and Y. As between different age levels within the same institution, there are likewise no significant differences between losses. IQ's of older children appear to be less variable than for the younger ones.

Mental Development as Related to Age of First Test.—In an effort to discover the influence of age, disregarding mental level and interval of residence, upon change in mental development, the individual test data have been analyzed according to yearly ages at time of first test. The following tabulation presents information relative to the two respective institutions for dependents, based on the results of individual Stanford-Binet examinations:

Age, Years	Children	Net Changes in IQ Mean	S.D.	$S.E._M$	Changes in IQ Disregarding Sign Mean	S.D.	$S.E._M$
		Institution A					
1	43	−10.1	16.3	2.5	15.6	11.2	1.7
2	54	− 4.3	12.6	1.7	10.4	8.3	1.1
3	73	− .9	11.3	1.3	8.9	7.1	.8
4	56	− .8	9.1	1.2	6.8	6.1	.8
5	91	.2	10.1	1.1	8.2	6.0	.6
6	54	.4	8.1	1.1	6.6	4.8	.7
7	62	− 2.6	8.3	1.1	6.7	5.5	.7
8	85	− 2.2	7.7	.8	6.4	4.9	.5
9	86	− 2.8	8.8	1.0	6.9	6.1	.7
10	77	− 2.1	7.3	.8	5.6	5.0	.6
11	83	− 2.3	7.2	.8	5.9	4.7	.5
12	71	− 2.7	7.0	.8	6.5	3.6	.4
13	40	− 1.7	6.6	1.0	5.0	4.6	.7
14	38	.1	7.0	1.1	5.4	4.4	.7
15	8	3.6	6.4	2.3	6.1	4.0	1.4
		Institution B					
5	10	3.0	7.9	2.5	7.0	4.7	1.5
6	8	.1	5.8	2.1	4.6	3.5	1.3
7	13	− 1.2	9.8	2.7	7.8	6.1	1.7
8	18	− 2.3	8.0	1.9	6.5	5.2	1.2
9	31	− .1	7.3	1.3	6.0	4.2	.8
10	33	− 3.0	7.6	1.3	6.4	5.0	.9
11	54	− .4	6.7	.9	5.3	4.1	.6
12	28	− 4.8	5.8	1.1	6.3	4.0	.8
13	30	− .6	7.4	1.4	5.8	4.6	.8
14	29	2.2	6.9	1.3	5.6	4.6	.9
15	16	3.4	3.8	.9	3.9	3.2	.8

The tabulation above (Institution A) shows a consistent progression of decreasing loss from children whose initial test occurred at one year of age to those tested at five years of age. A difference of 9.9 IQ points is shown between the extremes of this series. Following age six, in both institutions another series of losses is indicated up to thirteen years, but at no individual age can the mean losses be considered significantly greater than zero. These children, as well as those at the older ages, remain fairly constant. In terms of mean change, the younger ages show considerably more variability than the ones above six years of age. It is interesting to note that no institutional differences can be observed in the general pattern.

As was pointed out in connection with the discussion in the pre-

vious section and in the preceding tabulation, age differences for the feeble-minded subjects were not evident when the same intervals of residence were compared. With the data at hand differences in mean changes were not shown between different ages within the same institution or between the same ages in the two institutions for the feeble-minded.

Mental Development as Related to the Individual's Relative Placement Above or Below the Mental Level of His School Grade. —In this section mental development has been related to the child's relative placement above or below the IQ level of his school grade at the time of the initial test. If association with other children of varying levels of mental ability in school is a factor influencing mental development, it would be interesting to see whether changes in IQ are related to the functional mental level of this group within the larger institutional environment. Accordingly analyses have been made of changes in IQ of children falling in the mental levels above or below the average of their respective grades. The Kuhlmann-Anderson tests extending over retest intervals of two years, three (or five) months and two years, eleven months, were used.

Comparing the results for the shorter (two years, three months or two years, five months) intervals, as presented in Table 8, only in grade four of Institution A does one find a statistically significant difference between those above and those below the mean of the grade. However, a trend is indicated for every grade without exception for those above the mean to lose more or gain less than those below the mean. This is similarly true for every grade for the two years, eleven months intervals (Table 8). In all grades and intervals, the mean IQ's range from 82.0 to 93.4. These are, in the main, within or close to the range of the dull-normal classification, which is the modal grouping for both institutions. So it is again demonstrated that the average of the group tends to set the pattern, with those above tending to lose and those below tending to gain or to lose less.

Mental Development of Children Transferred from an Institution Designed for One Level of Mental Ability to Another Primarily for a Different Level

When children are transferred from one institutional environment designed for children of one level of mental ability to another where the mental level is markedly different, they are

confronted with more than a problem of adjustment to a new situation. This is the situation encountered by the children transferred from homes for dependents to schools for the feeble-

Table 8

Change in IQ for Groups According to the Mean IQ of the Grade for Institutions A and B

Relation to Mean IQ	Children	Interval of Residence		Net Changes in IQ			Changes in IQ Disregarding Sign		
		Years	Months	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution A									
Grade 2 (Mean IQ, 85.3)									
Above	28	2	3	− .9	7.1	1.3	6.1	3.7	.7
Below	21	2	3	3.2	6.9	1.5	6.3	4.4	1.0
Above	30	2	11	− .1	6.2	1.1	4.7	4.1	.7
Below	20	2	11	6.0	8.0	1.8	8.4	5.5	1.2
Grade 3 (Mean IQ, 85.7)									
Above	15	2	3	−1.3	7.0	1.8	5.7	4.2	1.1
Below	20	2	3	− .8	4.5	1.0	3.5	2.9	.7
Above	13	2	11	.3	5.0	1.4	3.9	3.2	.9
Below	15	2	11	−1.1	6.5	1.7	5.3	3.9	1.0
Grade 4 (Mean IQ, 88.5)									
Above	24	2	3	−3.1	6.5	1.3	5.6	4.5	.9
Below	27	2	3	4.6	5.5	1.1	5.6	4.4	.8
Above	24	2	11	.1	5.8	1.2	4.4	3.8	.8
Below	17	2	11	6.1	6.9	1.2	7.7	5.1	1.2
Grade 5 (Mean IQ, 91.7)									
Above	19	2	3	− .1	6.9	1.6	6.1	3.3	.8
Below	21	2	3	.6	5.2	1.1	3.7	3.7	.8
Above	18	2	11	.1	7.3	1.7	5.9	4.2	1.0
Below	12	2	11	3.9	5.3	1.5	5.4	3.7	1.1
Grade 6 (Mean IQ, 93.4)									
Above	9	2	3	−4.1	10.0	3.3	8.6	6.5	2.2
Below	8	2	3	−2.1	6.3	2.2	5.9	3.1	1.1

Table 8 (Continued)
Change in IQ for Groups According to the Mean IQ of the Grade for Institutions A and B

Relation to Mean IQ	Children	Interval of Residence		Net Changes in IQ			Changes in IQ Disregarding Sign		
		Years	Months	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution B									
Grade 3 (Mean IQ, 82.0)									
Above	7	2	11	−6.7	4.0	1.5	6.7	4.0	1.5
Below	11	2	11	.4	4.4	1.3	3.8	2.2	.7
Grade 4 (Mean IQ, 86.9)									
Above	9	2	5	.2	9.1	3.0	7.1	5.7	1.9
Below	8	2	5	3.1	3.9	1.4	3.9	3.1	1.1
Above	8	2	11	7.6	5.3	1.9	7.6	5.3	1.9
Below	9	2	11	8.9	5.6	1.9	8.9	5.6	1.9

minded. In homes for dependents these individuals are in the lower mental strata of an institutional environment designed for normal and dull-normal children. Upon being shifted to schools for the feeble-minded, they are placed in an environment established for feeble-minded children. They find themselves among those in the higher mental strata in this new environment.

The situation is the reverse when normal and dull-normal children are transferred from schools for the feeble-minded to homes for dependents. In schools for the feeble-minded, these children are markedly above the mental level of the institution. After transfer, they find themselves in an environment containing associates of equal mental ability, where they are distributed about the average mental level of the group.

This investigation is fortunate in having the mental test records available on a large number of children who have been transferred from one institutional environment to another. When the State Board of Control began its program of psychological study of children in state institutions, it was discovered that the populations of the state homes for dependents were too heavily loaded with

children of feeble-minded and borderline mental levels. As a result of an extensive program of foster home placement over a period of years, factors of selection had operated against children in these lower mental levels, and they had gradually accumulated in number. Consequently, as soon as facilities were available in institutions for the feeble-minded, children of feeble-minded mental level were transferred to these institutions. Gradually the number remaining in homes for dependents has been radically reduced; but, because of the lack of housing facilities in the institutions for the feeble-minded, it has not been possible to transfer all cases for whom transfer has been recommended.

On the other hand, a small number of cases was discovered of dull-normal and normal children in institutions for the feeble-minded. Some of these had been born of feeble-minded mothers who had been committed to the institution prior to or following the child's birth. Others had come in as children who were believed to be feeble-minded, but on whom adequate tests had not been made. Likewise, these children have been transferred to the homes for dependents as fast as facilities allowed. In all, data on sixteen of these children, on whom tests are available following a period of transfer, will be reported in this section.

The mental development of all of these children has been studied by periodic retests on the Stanford or Kuhlmann Revisions of the Binet Scale following transfer. Analyses of these data on various individuals following transfer will now be presented.

Mental Development as Related to Mental Classification at Transfer.—As a basis for studying the relationship of mental development to mental classification at transfer, analyses were made of changes in IQ according to initial IQ at transfer. The following tabulation presents the data for the transfers from Institutions A and B to Institutions X and Y:

IQ Level	Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
		Mean	S.D.	$S.E._M$	Mean	S.D.	$S.E._M$
30 to 39	7	37.4	20.1	7.6	37.4	20.1	7.6
40 to 49	16	4.9	23.8	6.0	19.8	14.1	3.5
50 to 59	57	− 5.8	6.6	.9	6.7	5.7	.8
60 to 69	127	− 4.7	7.5	.7	6.9	5.6	.5
70 to 79	43	− 6.5	4.9	.8	6.6	4.8	.7

It can be seen that for individuals falling within the IQ range

of 50 to 79,[3] a loss of about five or six points occurs following transfer. Between 10 point groupings within this range, no significant differences in change were found. The group ranging between 40 to 49 IQ remained fairly constant, but showed large variability. The most striking change occurred with children falling in the 30 to 39 interval. A difference of 32.5 IQ points is seen between children in this group and those in the next higher interval, and this difference is significant in spite of large ranges of variability within each classification. These few children were young when transferred, and seemingly profited most from the new environment.

In order to see if differences in mental development were taking place over similar intervals before and after transfer, a group of twenty-eight children were selected for study. These cases consisted of all the children on whom retests were available over similar periods before and after transfer. The findings are presented below:

Age Groupings	Children	Net Changes in IQ Before Transfer Mean	S.D.	$S.E._M$	Following Transfer Mean	S.D.	$S.E._M$
Under Six years	10	1.5	7.5	2.4	−6.6	5.2	1.7
Six to twelve years	18	−2.1	3.9	.9	−5.1	2.5	.6
Total	28	− .8	5.7	1.1	−5.6	3.8	.7

It can be seen that the ten children under six years of age at the initial test showed a mean difference of 8.1 points in the direction of loss after transfer. There are 99 chances in 100 that the true difference is greater than zero. For eighteen children between six and twelve years of age, a mean difference of 3.0 points is in the direction of loss after transfer. Taking all the children together a significant difference of 4.8 points shows that the true difference is probably greater than zero, in the direction of loss following transfer to the schools for the feeble-minded.

In the following tabulation a comparison is made of two groups of feeble-minded children in Institution Y:

[3] Most of the cases in the 70 to 79 interval were in the lower range of the interval. A number of children within a few points of 70 IQ were recommended for transfer on the basis of factors other than IQ alone, such as age, social maladjustment, and educational retardation.

IQ Level	Children	Net Changes in IQ Mean	S.D.	$S.E._M$	Changes in IQ Disregarding Sign Mean	S.D.	$S.E._M$
		Hemlock Nontransfers					
50 to 59	13	−3.6	6.1	1.7	5.8	4.1	1.1
60 to 69	14	−4.8	3.1	.8	5.1	2.6	.7
70 to 79	8	−5.6	7.6	2.7	7.9	5.2	1.8
		Hemlock Transfers					
40 to 49	17	−2.4	3.5	.8	3.5	2.3	.6
50 to 59	43	−3.2	6.6	1.0	6.1	4.0	.6
60 to 69	69	−4.7	6.4	.8	6.2	4.9	.6
70 to 79	19	−9.1	6.1	1.4	9.1	6.1	1.4

Both groups live in the Hemlock cottage. One group consists of transfers from other institutions, while the other group consists of nontransfer residents. There are no significant differences for comparable IQ levels for the two groups. There is a trend in both groups for losses to be greater for larger IQ levels, but the differences between adjacent levels are not significant. Differences are not large enough between similar IQ levels of these groups and the total transfer population (tabulation, p. 41) to be statistically significant. In the institutions for the feeble-minded, transfers and nontransfers follow a similar pattern of losses.

Let us now turn to a consideration of normal and dull-normal

IQ at Transfer	Age at Transfer Years	Months	Interval of Residence, Months*	Gain or Loss
108	2	5	22	− 14
106	4	3	5	− 10
102	1	5	20	− 1
99	3	2	12	− 3
94	5	10	18	− 8
93	4	6	29	− 1
85	12	7	18	0
85	3	1	5	+ 18
84	4	9	24	+ 15
84	5	2	8	+ 7
82	6	4	10	+ 4
80	10	7	13	+ 1
79	13	3	18	+ 7
79	6	6	17	+ 5
78	8	6	18	+ 9
77	13	3	19	+ 5

* Following transfer

Table 9
Dull-Normal and Normal Children Transferred from Institutions X and Y to Institutions A and B According to IQ and Age at Transfer

Status at Transfer	Children	IQ			Net Changes in IQ			Interval of Residence*		
		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
93 IQ and above	6	100.3	5.7	2.3	−6.2	4.8	2.0	17.7	7.6	3.1
85 IQ and below	10	81.3	2.9	.9	7.1	5.4	1.7	15.0	5.5	1.8
Under 6 years	9	95.0	8.8	2.9	−7.3	4.7	1.6	15.9	8.2	2.8
6 years and above	7	80.0	2.5	1.0	4.4	2.9	1.1	16.1	3.1	1.2

* In months.

children transferred from the schools for the feeble-minded to the homes for dependents. In all, there are only sixteen cases on which retests following transfer are available. These cases represent practically the entire group of transfers, the few cases not having retests being negligible. While this number of subjects is small, they show a definite consistency of trend.

The following tabulation presents data on each child, giving chronological age at transfer, IQ at transfer, interval to retest, and change in IQ. The data were tabulated in order of IQ at time of transfer. The consistency of trend is clear. Every case with an IQ of 93 or over at transfer lost in IQ between transfer and the date of the next retest. Every child with an IQ of 85 or below gained during the interval following transfer, except one who remained constant. (There were no IQ's between 85 and 93.) Table 9 points toward losses for those with IQ's of 93 and above and the average gains for those with IQ's 85 and below. Those with IQ's above 93 show an average loss of —7.1 IQ points, over intervals averaging eighteen months. The ones with IQ's of 85 and below show a 7.1 point increase over intervals averaging about sixteen months.

Figure 1 shows the children whose IQ at transfer was 85 or below with tests before and following transfer plotted. For all cases, losses were taking place in intervals before transfer. After transfer all show gains except one, and this child remains constant following a nine year period of loss prior to transfer. Figure 2 shows the opposite picture. Every child with an IQ of 93 or over at transfer lost in the interval immediately following transfer. In three of five cases on whom tests were available before transfer, substantial gains were registered for the interval just prior to transfer. The children gaining, as seen in Figure 4, are all young children from Institution X. It is quite conceivable that the kindergarten program of the school, and the attention given these children by the attendants and older patients in the institution, are very stimulating. Furthermore, these children are associating with older patients whose mental level is considerably above that of the younger normal children. In other words they are actually below the mental age level of their associates.

The question may be raised also as to whether this apparent loss, following transfer, is the immediate result of a necessary and difficult period of adaptation to new demands and institutional ad-

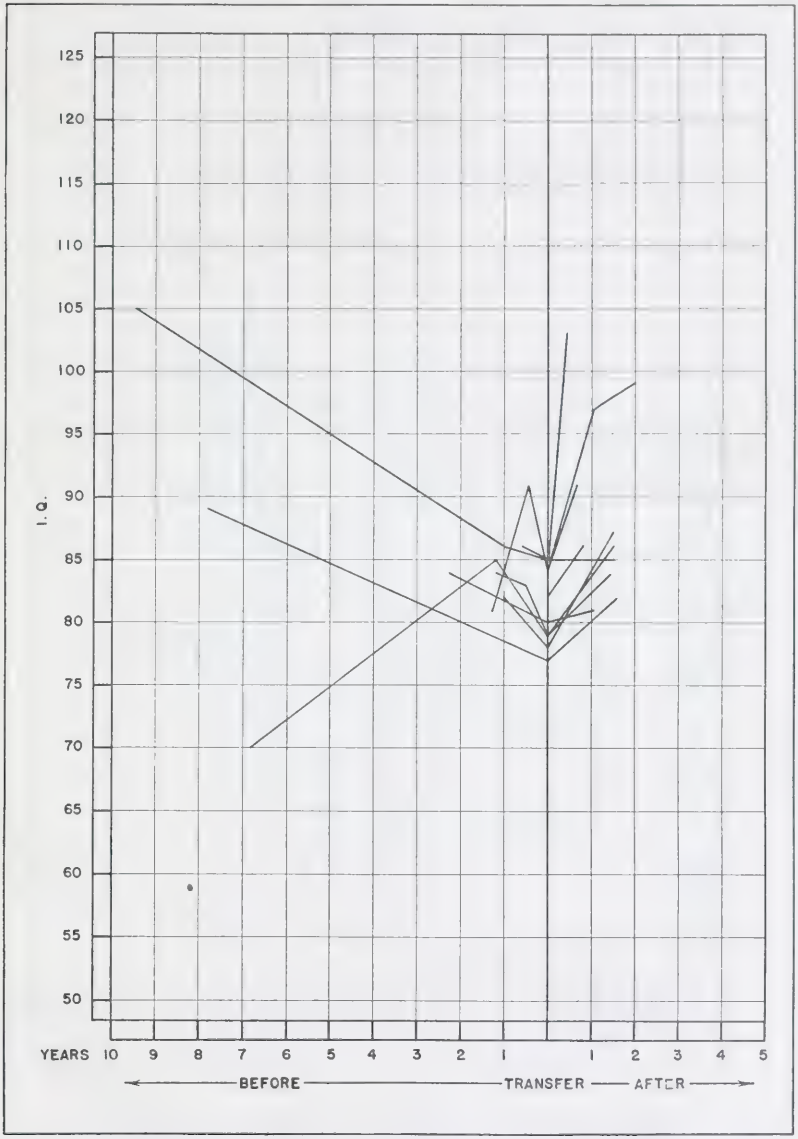

FIGURE 1. Children with IQ's of 85 and Below at Transfer, Before and After Transfer from Institutions X and Y to Institutions A and B

justments. Possibly, after adequate time is allowed for the necessary re-orientation, growth will again be on the increase. An answer

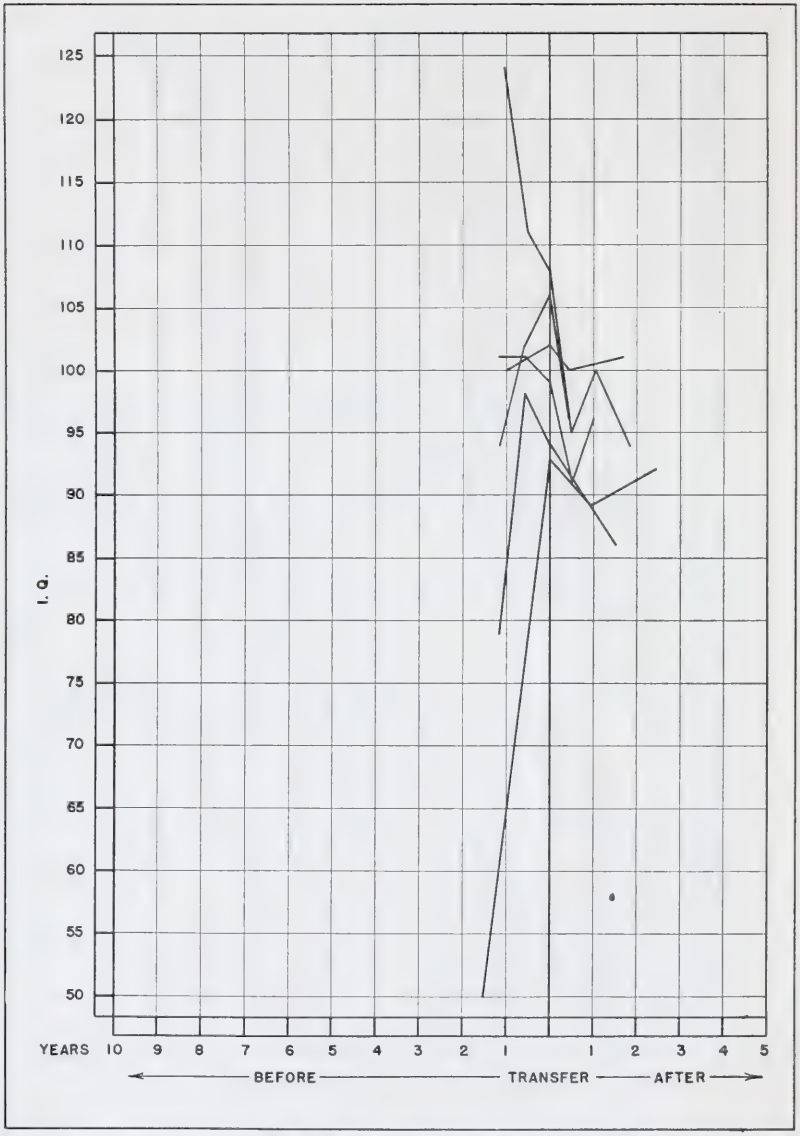

FIGURE 2. Children with IQ's of 93 and Above at Transfer, Before and After Transfer from Institutions X and Y to Institutions A and B

to this question must wait for an additional accumulation of residence and later retests.

At present, however, the data point toward the conclusion that following transfer to an environment nearer their level of mental

Table 10
Change in IQ of Children Transferred from Institution A to Institutions X and Y
According to Intervals of Residence Following Transfer

Interval of Residence				Children	IQ at Beginning of Interval			Net Changes in IQ			Changes in IQ Disregarding Sign		
Years	Months	Years	Months		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
0	6 to	2	11	176	61.0	10.9	.8	−1.4	12.7	1.0	7.8	10.1	.8
1	0 to	1	11	82	60.7	8.7	1.0	− .2	13.4	1.5	7.7	10.9	1.2
2	0 to	2	11	79	62.2	7.8	.9	−4.0	8.8	1.0	7.1	6.5	.7
3	0 to	3	11	43	62.1	6.7	.9	−9.4	9.0	1.4	12.1	4.8	.7
4	0 to	4	11	18	62.5	7.3	1.7	−11.2	6.0	1.4	11.2	6.0	1.4

* Kuhlmann-Anderson Tests.

ability, dull-normal and normal children seem to follow the pattern set by the average of their associates in this new environment. The data agree in general trend with the findings presented above for residents of the orphanages.

Mental Development as Related to Interval of Residence After Transfer.—Table 10 presents data showing change in IQ of chil-

Table 11

Change in IQ of Children Transferred from Institutions A and B to Institutions X and Y According to Age of First Test and Interval of Residence

Interval of Residence				Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
Years		Months			Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
6 Months to 6 Years, 5 Months										
0	6 to 2	11		40	5.6	23.9	3.8	18.2	16.5	3.8
1	0 to 1	11		23	5.2	23.4	4.9	17.1	23.4	3.5
2	0 to 2	11		13	−2.2	18.5	5.1	15.2	18.5	3.0
3	0 to 3	11		10	−6.6	15.7	5.0	14.8	15.7	2.6
6 Years, 6 Months to 9 Years, 5 Months										
0	6 to 2	11		37	−3.0	5.2	.9	4.6	3.8	.7
1	0 to 1	11		14	−1.5	5.9	1.6	5.1	3.5	.9
2	0 to 2	11		20	−4.0	4.5	1.0	4.4	4.1	.9
3	0 to 3	11		19	−7.4	6.8	1.6	8.1	6.0	1.4
4	0 to 4	11		7	−11.6	5.4	2.0	11.6	5.4	2.0
9 Years, 6 Months to 12 Years, 5 Months										
0	6 to 2	11		51	−4.1	4.1	.6	4.8	3.2	.5
1	0 to 1	11		20	−2.9	3.8	.9	3.9	2.8	.6
2	0 to 2	11		27	−5.2	4.2	.8	5.9	3.2	.6
3	0 to 3	11		17	−8.9	5.0	1.2	9.1	4.8	1.2
4	0 to 4	11		9	−11.9	6.2	2.1	11.9	6.2	2.1
12 Years, 6 Months to 15 Years, 5 Months										
0	6 to 2	11		48	−3.2	4.5	.7	4.7	2.9	.7
1	0 to 1	11		25	−2.3	3.9	.8	3.7	2.5	.8
2	0 to 2	11		19	−3.7	5.9	1.4	6.3	3.1	1.4

dren transferred to institutions for the feeble-minded when age and mental level have been disregarded. For all periods, a loss is registered. A trend is evident for losses to increase with length of residence. Losses for intervals less than three years are significantly less than for intervals of three to four years, or four to five years. For intervals over three years losses of from 9 to 11 IQ points may be expected. Between adjacent yearly intervals, however, no significant losses can be claimed. With intervals over three years, significantly greater mean changes are found.

Comparing the transfer with the nontransfer group in Institutions X and Y (Tables 7, 10, 11), no significant differences were found for comparable intervals.

Mental Development as Related to Age of Transfer.—For children transferred from homes for dependents to institutions for the feeble-minded, for intervals less than three years, those under six years of age show a mean gain of 5.6 IQ points, which is significantly different from the older ages. Because of the wide spread of gains and losses for the younger ages, no differences were found between the other age groups or the nontransfer residents of Institutions X and Y. (Table 7 and tabulation, p. 62). It can be seen in the following tabulation that, for children living in the Hemlock cottages, Institution X, the net changes of IQ are very similar:

Interval Between Tests	Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
		Mean	S.D.	$S.E._M$	Mean	S.D.	$S.E._M$
Hemlock Residents 7 Years and Over							
Under two years	24	−2.5	6.5	1.3	5.2	4.6	1.0
Over two years	8	−7.9	3.4	1.2	7.9	3.4	1.2
Hemlock Transfers Under 6 Years							
Under two years	12	−1.2	7.6	2.2	6.7	3.7	1.1
Over two years	8	−5.1	8.5	3.0	8.9	4.4	1.6
7 Years to 12 Years							
Under two years	41	−2.9	5.0	.8	4.7	3.5	.5
Over two years	65	−7.0	6.4	.8	7.6	5.6	.7
13 Years and Over							
Under two years	16	−2.4	3.2	.8	3.3	2.3	.6
Over two years	7	−1.9	6.4	2.4	6.1	2.5	.9

The normal and dull-normal transfers from schools for the feeble-minded to the homes for dependents may be divided into two age groups: under six and over six years of age. The tabulation (p. 42) indicates that the number of cases in each category is too small

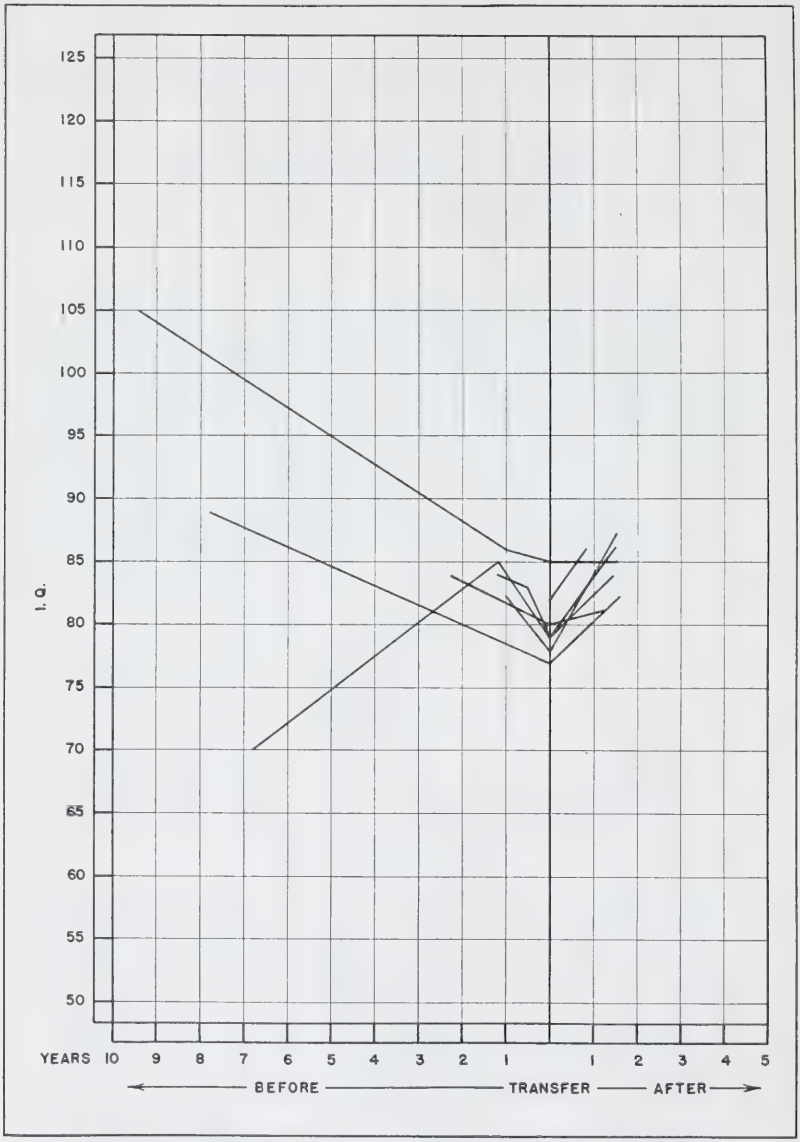

FIGURE 3. Children Six Years of Age and Over at Transfer, Before and After Transfer from Institutions X and Y to Institutions A and B

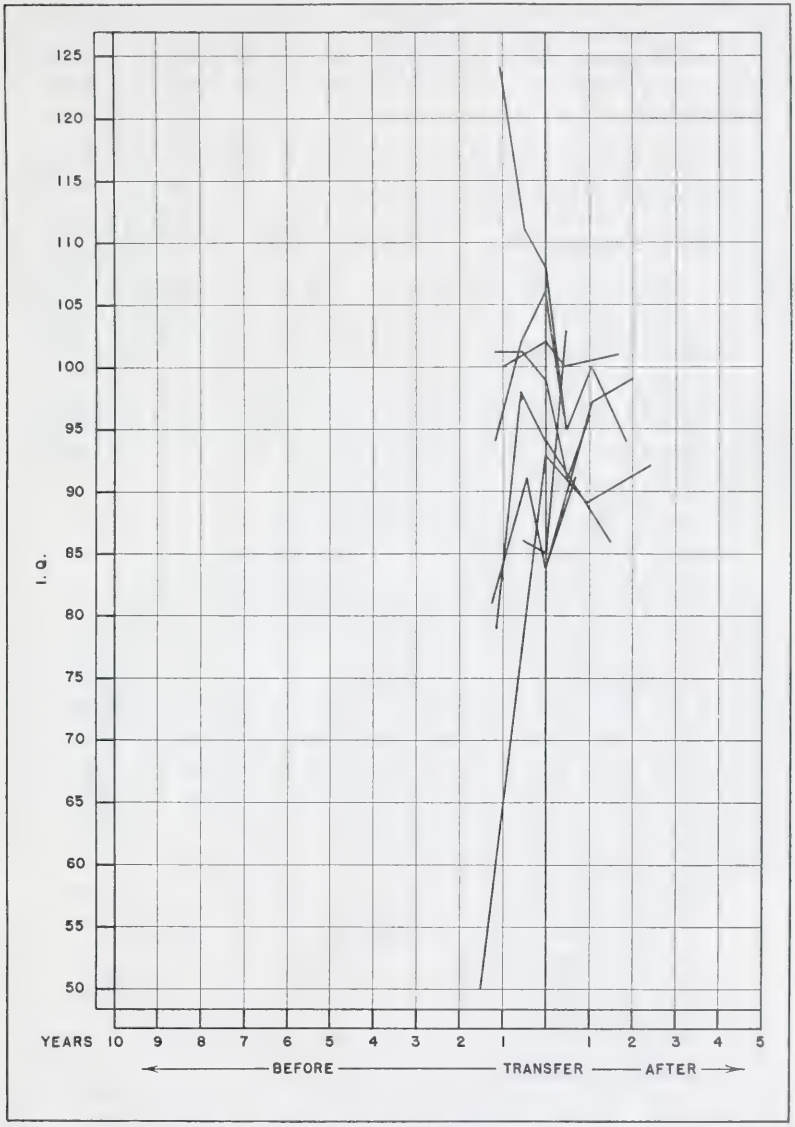

FIGURE 4. Children Six Years of Age and Under at Transfer, Before and After Transfer from Institutions X and Y to Institutions A and B

for significant differences to be found between the groups in regard to gain or loss in IQ. Since the mean IQ of the group under six years is 15.6 IQ points above that for the older group, any trend

toward gain for the older group or loss for the younger group is probably more a function of relative mental level than age differences, as seen in the similarity of Figures 3 and 4 to Figures 1 and 2, respectively.

The Influence of Environments of Differing Mental Level Upon Individuals of the Same Mental Level

The mental level in an institution may be an important factor in a child's mental development. The rate of mental development of a child in an institution designed for normal and dull-normal children should vary from that of a child of similar mental ability in an institution designed for the feeble-minded. In this section certain data are presented as proof of this hypothesis.

The approach used in this comparison is the method of matched groups. In order to obtain as fine control as possible, three criteria were decided upon as the bases for pairing:

1. Individuals must be within 3 points in IQ on initial test.
2. At the time of the first test, chronological age must not vary more than six months.
3. The length of the intervals between the initial tests and the retests must be within six months.

Various environmental comparisons were set up by pairing individuals on this basis. In most cases only one individual was paired with another individual, but in some instances where the criteria were met, one individual might enter into two or more pairings. These cases were the exception rather than the rule. The following environmental groupings are compared in relation to mental development:

1. Residents at homes for dependent children, Institutions A and B, with nontransfers in institutions for the feeble-minded, Institutions X and Y
2. Residents at Institutions A and B with transfers from these institutions in Institution X
3. Residents at Institution A with transfers from Institutions A and B to Institution Y
4. Residents at Institution B with transfers from A and B to Y
5. Total pairings of residents at Institutions A and B with transfers and nontransfers at Institutions X and Y by chronological age groupings (under six, seven to twelve, thirteen and over)
6. Total pairings of residents at Institutions A and B with transfers and nontransfers at Institutions X and Y

The results of these analyses are presented in the following tabulations:

Matched Groups	Children	Net Changes in IQ Mean	S.D.	$S.E._M$	IQ Mean	Range
Residents at Institutions A and B	48	.5	6.0	.9	68.6	51 to 98
Residents at Institutions X and Y	48	−5.5	7.1	1.0	68.9	52 to 99
Residents at Institutions A and B	30	3.6	7.4	1.4	69.0	60 to 74
Transfers to Institution X	30	−4.7	7.3	1.3	68.9	61 to 73
Residents at Institution A	49	2.6	7.8	1.1	68.4	50 to 75
Transfers to Institution Y	49	−3.9	9.9	1.4	68.3	49 to 77
Residents at Institution B	39	1.7	5.7	.9	70.4	65 to 73
Transfers to Institution Y	39	−4.5	3.7	.6	70.1	63 to 73

Age Groupings	Children	Net Changes in IQ Mean	S.D.	$S.E._M$	IQ Mean	Range
Residents in Institutions A and B						
Under six years	21	8.5	10.2	2.2	64.1	50 to 82
Seven to twelve years	76	.2	6.2	.7	70.3	56 to 98
Thirteen years and over	50	2.9	4.6	.7	68.2	59 to 73
Total all ages	147	2.3	7.0	.6	68.7	50 to 98
Residents and Transfers in Institutions X and Y						
Under six years	21	−4.3	11.8	2.6	64.3	49 to 81
Seven to twelve years	76	−5.5	5.6	.6	70.3	55 to 99
Thirteen years and over	50	−4.2	3.3	.5	68.4	62 to 76
Total all ages	147	−4.9	7.8	.6	68.8	49 to 99

The findings may be summarized as follows:

1. When children at Institutions A and B are paired with nontransfers at Institutions X and Y, the orphanage children tend to remain constant while the children in the institution for the feeble-minded tend to lose. A significant difference of 6.0 IQ points is found between these paired groups.

2. Comparison of residents of the two homes for dependents (A and B)

and transfers from these homes to an institution for feeble-minded (X) shows a difference of 12.7 points, and is statistically significant.

3. Residents at Institution A when paired with transfers from Institutions A and B to Institution Y, indicate a significant difference in favor of gain for the orphanage group.

4. When children at Institution B are paired with children transferred from the two homes for dependents to Institution Y, a similar significant difference may be noted.

5. Regardless of age, the orphanage children continue to stay constant or gain while their pairs in schools for the feeble-minded tend to lose. In each case significant differences were obtained.

6. Throwing all individuals from the orphanages who entered into pairings into one group, and similarly combining all the paired individuals in the schools for the feeble-minded, a total of 147 pairs is obtained. In such a composite some pairs doubtless are entered several times. Their number is not large enough, however, to influence to any great extent the total effect. The results show a reliable mean gain of 2.3 IQ points for the orphanage children, while their pairs in schools for the feeble-minded show a mean loss of −4.9. The difference is significant.

These findings reveal a high degree of internal consistency. In every comparison there is a consistently significant difference between these carefully paired individuals in environments which differ at least 30 IQ points in mental level. In not a single comparison do the means of the orphanage groups show a loss, while a loss is indicated in every mean for the groups in the institutions for the feeble-minded. It would seem that for these paired individuals environmental influences are operating to produce changes in the rate of mental growth. In one environment this results in a tendency for the IQ to remain constant, or to gain slightly, while in the other a trend towards decrease is found.

Summary

In this chapter the mental development of children was studied in relation to certain levels of mental ability, age, and intervals of residence in differing institutional environments. Children from two state homes for dependents and two state schools for the feeble-minded were used in the analyses. Results are based on the Stanford and Kuhlmann Revisions of the Binet Scale as well as corroborative evidence from Kuhlmann-Anderson group tests. In terms of social participation, the homes for dependents were described as presenting environmental demands at the level of the normal or dull-normal child, while at the institutions for the feeble-minded

the environmental stimulation is probably at the level of the low or middle moron.

The findings are presented in three main areas of investigation: (1) where the child remains in the same general environment, (2) where there has been a major shift of institutional environment, and (3) where children of the same mental levels reside in differing environments.

Children Remaining in Same General Environment

The following results summarize the findings of this chapter as regards the mental development of children remaining in the same general environment:

1. In environments where the mental level is primarily that of the normal and dull-normal child, individuals classified as borderline and moron tended, as groups, to remain constant or to show slight gains, while those designated as normal or superior showed consistent losses. A trend is indicated for the losses to be dependent upon the extent of deviation above the average of the group. Mean changes tend to increase with higher IQ levels, and the amount of change varies from 5 to 17 points. No consistent institutional differences were found for comparable mental levels as between these two homes for dependents.

2. For the children residing in institutions for the feeble-minded one finds a consistent picture of loss for children at all IQ levels studied. The numbers of cases at the various IQ levels are insufficient to bear out any trend for losses to increase progressively with higher mental levels.

3. When the subjects in the homes for dependents were classified by four-year age groupings, no significant differences were found between the mean gains or losses at comparable IQ levels for different ages. The data on non-transfer children in schools for the feeble-minded were inadequate for refinement according to mental level and age taken together.

4. No institutional differences were found for comparable intervals of residence in the two homes for dependents, but a general trend of loss with residence was indicated. Losses tend to increase progressively during intervals of residence ranging from one year to three years, six months. With the group tests, a practice effect over a seven months interval tended to cover up any possibility of showing a loss with length of stay. When comparable intervals were related, no significant differences were found for rate of mental development as between adjacent intervals in the same institution or between different institutions. Over long intervals of residence in Institution X, individuals classed as borderline and high moron show large average losses.

5. Changes in mental development occur for orphanage children of differing ages. Children under four years of age appear to lose during residence in Institution A especially for intervals between one year and one year, six months. They present large variabilities of gains and losses. Older age groupings show no institutional differences for comparable intervals of residence. For children five through eight years of age, small gains occur for short in-

tervals of residence, changing to larger losses in intervals over one year, six months. At ages nine to twelve a trend is seen for small gains at the shorter intervals to change to losses for periods of residence between one year, six months and two years, six months. Older ages remain practically constant for differing intervals and mean changes are smaller for the older subjects.

6. Age differences were found among the orphanage children when age was considered alone. Children under six years of age showed a consistent progression of decreasing loss with age. After six years there is a picture of loss to age thirteen, but at no single age are the means reliable. These children, as well as the older ones, remain fairly constant. Likewise the younger children showed greater variability than the older ones. Among the feeble-minded no age differences could be noted with the data at hand. Institutional differences were not indicated for either the orphanages or schools for the feeble-minded.

7. A trend is indicated in each comparison for children above the mental level of their grade to lose more or gain less than those below the mean. Since the means of the grade extend over a range similar to that of the dull-normal classification, it is probable that the average of the institution influences the grade level comparisons. The results are consistent with the earlier findings that the group level helps to set the pattern of mental development for its members.

Children Undergoing Major Shift in Institutional Environment

When children are transferred from an institution designed for one level of mental ability to another primarily for a different level, the following findings were indicated:

1. When children from two homes for dependents were transferred to institutions for the feeble-minded, those classified at transfer as borderline and moron show consistent losses following transfer. Those classed as high imbeciles remained fairly constant. A few young children, ranging in IQ from 30 to 39, showed striking gains in the new environment. Children with IQ's from 50 to 59 at transfer show loss after transfer to schools for the feeble-minded as compared with those of same IQ before transfer.

2. After transfer to institutions for the feeble-minded, no differences are apparent for individuals of the same mental level living in the same cottage. The transfers follow the pattern of losses set by the level of the new environment.

3. For dull-normal and normal children transferred from institutions for the feeble-minded to the orphanages, mental development after transfer also follows the pattern set by the level of the new environment. All children with IQ's above 93 showed losses, while all those with IQ's below 85 showed gains.

4. After transfer, children from the orphanges tend to lose in IQ in schools for the feeble-minded. Losses over periods less than three years are significantly less than those over periods from four to five years. For comparable intervals, the transfers again show the same trend as the nontransfers in that environment.

5. For intervals under three years of residence, younger children transferred from homes for dependents to schools for the feeble-minded showed a mean gain of 5.6 IQ points, which is significantly different from the older ages, where a loss is indicated. These ages also showed greater variability.

6. When the normal and dull-normal transfers to the orphanages are divided into two age groups, differences were found to be insignificant. Any trend toward gain for the older group or loss for the younger group is probably more a function of relative mental level than age differences.

Children of the Same Mental Levels in Differing Environments

Finally, the influence of environments of differing mental level upon individuals of the same intellectual status has been shown in six comparisons between matched groups in two differing environments. Holding IQ, age, and intervals of residence constant, these groups show significant differences in the two environments. In schools for the feeble-minded, individuals tend to show losses, while in the orphanages children of the same age and mental level remain fairly constant over comparable intervals. It would seem that for these paired individuals, environmental influences are operating in differing institutional environments to produce changes in the rate of mental development of children within these institutions. And since in the orphanages these children represent those of the lower mental levels, while in the institutions for the feeble-minded they are among those in the higher mental levels, it can be said that the mental level of associates tends to set the pattern of environmental stimulation.

CHAPTER IV

MENTAL DEVELOPMENT AS RELATED TO EDUCATIONAL ACHIEVEMENT OF CHILDREN IN INSTITUTIONS

Specific Problems

If children in a general institutional environment show changes in direction in mental development, the problem arises as to whether any relationships can be established between these changes and certain areas of influence in the institutional setting. Since the most extensive organized effort toward mental stimulation offered by the institution is the child's participation with others in educational activities, certain factors in educational achievement were selected for study. This chapter, then, is devoted to an investigation of mental development as related to the child's initial status or change in relative placement in educational achivement within an institutional environment.

Certain problems immediately present themselves for consideration when the educational achivement of one's associates is looked upon as an influence affecting mental development. The question arises, "What is the relation of mental development to the levels of achievement of the child's classmates in the same school grade and to other children in the system as a whole?" If a child is achieving above the standard for his age (as seen in EQ) or above the central tendency of his grade, is he being more highly stimulated to mental growth than the child below the age standard and grade average, or vice versa? Are gains in degree of achievement reflected to different extents in mental development at certain lower levels of achievement than at higher levels? Can direct relationships be found between change in educational achievement and change in IQ? To what extent are changes in mental development related to failure in school grade over certain intervals of institutional residence? These are some of the problems to be considered when the child's relative placement in educational achievement is studied in relation to mental development.

Previous Studies on the Relation of Mental Development to Educational Achievement

Anyone reviewing the literature in the field of educational measurement is impressed by the ever-increasing body of research being

published. New comparisons are continually being made on large numbers of children with more valid and reliable techniques. And yet in none of these approaches do we find mental development related to the individual's relative educational status, or change of status, in his school group. It is significant that Burks (14) in her summary of the literature on the determiners of the intelligence quotient and the educational quotient is unable to do more than present a few studies dealing with the limitations upon achievement set by mental levels of various grades. That change in IQ might be studied in relation to the child's relative educational achievement is a new approach.

Numerous studies showing correlations between intelligence and achievement give varying results. Studies by Book, Miller, Proctor, and Madsen are representative of these at the high school level. Book's (10) state-wide study of high school seniors in Indiana showed correlations in the neighborhood of .28 as between academic grades and intelligence test scores. Rice (cited by Book (10)), in a more careful study of part of these data, raised the correlation to .47. Madsen's (51) study of children in the South Omaha High School showed similar correlations ranging from .27 to .51. Miller (54) reports that a correlation of teacher's marks with intelligence on the Miller group test showed a relationship of .52. Proctor (63) has shown that a composite of teachers' estimates of intelligence correlates .58 with IQ of high school pupils.

In the elementary school field the correlational technique is reported in such studies as those by Terman, Freeman, Gates, Gordon, Burt, St. John, Line and Glen, and Hilden and Skeels. Terman reports a correlation of .45 between school marks and mental age in normal children (79), while for 109 gifted children the correlation between Stanford Achievement scores and IQ ranged from .26 to .46 for various subjects (81). Freeman (31) has indicated a correlation as high as .77 between Stanford-Binet IQ's and percentile scores in school achievement, while the use of the Dearborn test gives a correlation of .73. Gates (34) shows that Stanford-Binet mental age correlates .54 with a composite of school achievement and almost as high for specific school subjects. Gordon's (36) study of mental and scholastic tests among retarded children shows rank-order correlations ranging from .71 to .78 as between IQ and EQ, the latter being based on the Ballard one-minute tests in speed of reading, adding, and subtracting. Burt's (16) findings indicate a coefficient of .74 when the scores on the Binet scale are correlated

with a composite of achievement in reading, writing, dictation, arithmetic, and composition. St. John (71) shows a correlation of .40 between teachers' marks and intelligence, while achievement test scores and intelligence show a relationship of .56.

The research by Line and Glen (49) attempts to study the factors influencing the correlation between intelligence and achievement. The subjects consisted of 524 pupils in a Toronto public school. Intelligence was measured by the National Intelligence Test and achievement was indicated by school marks. Intelligence test scores and marks were transposed into standard scores for each grade, and correlations were computed. Variations in motivation were studied in relation to the number of misdemeanors per grade, while the influence of grade repetition was not found to be an explanation for variations in the correlations between grades. Their results indicate that for these subjects the relationship between intelligence and achievement varies from grade to grade. This variation is seemingly due to efficiency of motivation, which in turn depends on the degree of interest.

A recent study by Hilden and Skeels (41) compares the Stanford-Binet Scale, the Kuhlmann-Anderson group test, the Arthur Point Scale of Performance, and the Unit Scale of Attainment. The subjects consisted of children in two state homes for dependents and a state training school for boys. Correlations between scores on the different tests by age levels were computed. Regression equations were used to indicate the extent to which one scale may tend to give higher or lower ratings than another. The values for each age level at the various IQ levels were estimated. Correlations were computed between IQ differences and age, in order to determine whether age carried any systematic relation to IQ differences on any given mental age level. By similar analyses, a study was made of the value of each of the intelligence tests for the prediction of school success as measured by the Unit Scales of Attainment. The results bearing on the relationship of intelligence and achievement are as follows (p. 229-230):

"4. The relationship between the Unit Scales of Attainment and each of the three intelligence tests (Kuhlmann-Anderson group tests, Stanford-Binet scale, and Arthur point scale) is shown by

(a) the respective r's of .84, .72, and .65
(b) the respective probable errors of estimate of 5.9, 7.5, and 9.0 points

(c) The correspondence between the estimated EQ's and the IQ's is greatest for the Kuhlmann-Anderson group test, less for the Stanford-Binet scale, and less still for the Arthur point scale."

Finally, certain studies should be mentioned which discuss the leveling effect taking place in achievement in relation to the level of the group. For example, Shewman's (74) study of 226 high school students over seven semesters of high school work indicates that those with high IQ's failed to live up to their expected achievement, those with low IQ's gained in achievement status, while the median group remained practically the same.

The study by Burt (16), referred to earlier, gives, in part, the following conclusions:

1. The most retarded mentally appear still more retarded educationally.
2. For those falling just below the average, a tendency is seen to "*coax and coach these milder dullards to a grade more closely fitted to their actual age.*" Their "attainment is greater than inborn ability" (mean IQ, 93.7; mean EQ, 95.8). (p. 176)
3. The superior group is retarded educationally. ". . . . . *despite superior talent,* [they] *are largely kept back scholastically,* depressed to a stage which answers more closely their actual years" (mean IQ, 106.9; mean EQ, 102.2). (p. 178)
4. The brightest children "*are . . . . . deprived of more than half their advancement*" (mean IQ, 123.1; mean EQ, 111.2). (p. 178)

Brown and Lind (13) have made a comparative study of school achievement in relation to mental age. Selected tests from the Stanford Achievement Scale were given to one group of subjects at the Lincoln State School for the Feeble-minded at Lincoln, Illinois, and to another group of children in a private school in Chicago. Their results indicate that "while children with IQ's from seventy to seventy-nine in the retarded group are making achievement scores from six to thirty months below their mental age in the different subjects, the children of the same level of intelligence in the average group are making achievement scores from two to sixteen months above their mental age. From this it would appear that the relation of achievement to mental age depends not so much upon the level of intelligence but upon the position of that level in the group receiving instruction." (p. 574)

In explanation of this relationship, the authors quote Pintner (60), who says:

> "In general, children possessing superior intelligence are the ones who are not working up to possible accomplishment, and the final verdict is that our educational system is failing to make use of the vast stores of intelligence which lie hidden and undiscovered." (13, p. 574)

The authors go on to say that "while it is not true that there are vast stores of undiscovered intelligence in the retarded group, it is true that the relatively bright children of this group are not working up to possible accomplishment."

> "The instruction of the teacher is usually adapted to the ability of the middle group or the ability of the larger number. If this is so, the duller children have a greater amount of stimulation relative to their ability than the brighter ones, and the tendency would be for those at the extremes to approach the achievement of the average child. . . . .
>
> "Again, the tendency has been to keep children of the same chronological age together in spite of differences in ability. The bright children, therefore, are not required to work up to their possible capacity of achievement, nor are they advanced as far as they should be. The dull children, on the other hand, are urged along in an effort to keep them in their chronological age group, and, because of this insistent pressure, are likely to acquire training above their capacity." (p. 574-576)

The findings of Pintner and Marshall (59), Torgerson (82), and Merrill (53) are in essential agreement with those of Shewman, Burt, and Brown and Lind.

Franzen (30), Madsen (52), and Dearborn and Cattell (23) show that, under school conditions which tended to cause students to work up to maximum capacity, the correlation between intelligence and achievement was decidedly increased. Madsen's methods of adapting instruction to individuals in ordinary heterogeneous classes raised the correlation coefficients from .58, .70, and .73 to .74, .82, and .84 respectively, and Franzen's method of homogeneous reclassification and adaptation of methods raised them from .62, .56, and .47 to .72, .62, and .55 respectively.

In summary, the following comments are pertinent:

1. While much research in educational achievement has been published, no studies are available which have investigated change in IQ in relation to the child's relative educational achievement.

2. Numerous studies showing correlations between intelligence and achieve-

ment give varying results. Correlation coefficients between scores on mental tests and school marks range from .27 to .51, while those between scores on mental tests and achievement tests range between .26 and .84. The extent of the relationships varies with the test used, grades, IQ level of the child, and the degree of efficiency of motivation. In many of these studies accurate controls of these conditions have not been kept.

3. Certain studies have shown the leveling effect taking place in achievement in relation to the level of the group. The children of higher ability tend to lose in achievement, while those in the lower levels of a group tend to gain. The point of view is found that the superior children are not working up to their possible accomplishment and that the lower ones are under great pressure to maintain their position with others of the same age. The duller ones have a greater amount of stimulation relative to their ability than the brighter ones, and the tendency is for those at the extremes to approach the achievement of the average of the group. The instruction, also, is probably adapted to the average child.

4. When changes are made in instruction and pupil classification which tend to cause students to work up to maximum capacity, the correlation between intelligence and achievement is decidedly increased.

These findings are in accordance with the hypothesis of mental development that the average of the group is an important determinant of growth.

The remainder of the chapter will be devoted to the analyses of change in IQ in relation to level of educational achievement and the position of that level in the population under consideration.

Procedure

The tests used in the analyses in this chapter are group tests of intelligence and achievement. The Kuhlmann-Anderson Intelligence Test and the Unit Scales of Attainment were administered to a total of 415 children in Institutions A and B. These tests were given in the late spring and summer of 1933, in the fall of 1935, and in the spring of 1936. In each case the Kuhlmann-Anderson test was given within a short time of the Unit Scales of Attainment. Besides the group test of achievement, the child's grades in the major subjects were averaged. Thus a slight difference is drawn between achievement in terms of knowledge and achievement as related to the demands of the school.

Findings

Mental Development as Related to Level of Educational Achievement

Table 12 shows changes in IQ as related to initial EQ[4] level of

4 The educational quotient is obtained by dividing the mid-educational age obtained on the Unit Scales of Attainment by the child's chronological age.

children in the two homes for dependents combined. Taking first the two years, five months interval, no significant differences are found from level to level. In the levels above 90 EQ, all means are negative, but not reliable. Mean change tends to increase slightly for each successive level above 80 EQ, but the differences between levels are not significant statistically. The high relationship be-

Table 12
Change in IQ as Related to Initial EQ Level of Dependent Children in Institutions A and B

Interval of Residence		Children	Net Changes in IQ			Changes in IQ Disregarding Sign			IQ at Beginning of Interval	
Years	Months		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation
70 to 80 EQ										
2	5	14	− .2	5.5	1.5	4.8	2.8	.7	75.7	8.3
	11	11	3.2	4.7	1.4	4.5	3.5	1.0	75.1	9.0
80 to 90 EQ										
2	5	41	1.0	5.4	.9	4.5	3.2	.5	82.6	6.0
2	11	31	2.7	6.1	1.1	5.6	3.7	.7	83.0	5.4
90 to 100 EQ										
2	5	52	− .7	6.9	1.0	5.4	4.5	.6	90.0	7.8
2	11	37	3.3	6.3	1.0	5.3	4.7	.8	88.3	16.3
100 to 110 EQ										
2	5	32	− .9	8.1	1.4	6.6	4.8	.9	100.1	8.2
2	11	28	− .3	9.1	1.7	3.9	8.2	1.6	101.3	8.3
110 to 120 EQ										
2	5	11	− .6	8.2	2.5	7.0	8.2	1.3	108.3	8.6
3	0	13	−1.5	8.9	2.5	7.2	8.9	1.5	108.0	8.3

tween EQ and IQ is seen in the progressive increase in mean IQ's with each higher level of achievement.

Similarly, over a two years, eleven months interval no significant differences were found. The mean change regarding sign is posi-

tive and larger between the EQ limits 70 to 100. As pointed out in Chapter III, it is probable that the test given in the fall of 1935 at the end of the two years, five months interval resulted in practice effects showing up in the test at the end of the two years, eleven months period.

In the levels above 100 EQ a negative change in IQ is indicated, but the means are not reliable. Mean variability probably follows the same patterns of increase with EQ level, even though practice effects operated to produce a seemingly smaller mean change at the 100 to 110 EQ level.

According to initial EQ level, no gains or losses in IQ are indicated.

Mental Development as Related to the Individual's Relative Placement Above or Below the Educational Achievement Level of His School Grade

If association with other children of varying levels of educational achievement has any influence on mental development, according to our hypothesis one would expect those individuals above the mean EQ of the grade to lose, while those below the mean would tend to gain. Accordingly, analyses were made of changes in IQ of those children in the upper group as compared with those in the lower group. Tests extending over two years, five months and two years, seven months intervals were again used.

Children in grades 4A, 5B, and 5A at Institution A who were in residence at the time of the final tests were studied over the respective intervals (Table 13). At Institution B individual grade analyses could not be made because of the small number of cases. Consequently all the individuals above their respective grade level in EQ were thrown together into one grouping and were compared with all those below their grade levels in achievement.

No significant differences in mental development were found between those above and those below the achievement level of their respective grades. The standard errors run fairly large throughout. Mean changes are smaller for those below the grade level for the two years, five months intervals, although for individual grades these differences are not significant.

The only conclusion that can be reached with the data at hand would appear to be that individuals above or below their grade level on initial achievement show no significant gains or losses over the respective intervals studied.

Table 13
Change in IQ as Related to the Child's Relative Placement Above or Below the EQ Level of His Respective Grade in Two Institutions for Dependent Children

Relation to Mean EQ	Children	Interval of Residence		Net Changes in IQ			Changes in IQ Disregarding Sign		
		Years	Months	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution A									
Grade 4A (Mean EQ, 96.0)									
Above	10	2	5	−2.0	7.6	2.4	5.8	5.2	1.7
Below	17	2	5	.2	5.9	1.4	4.8	3.4	.8
Above	11	2	11	1.8	6.6	2.0	5.1	4.6	1.4
Below	14	2	11	3.9	7.5	2.0	7.1	4.7	1.2
Grade 5B (Mean EQ, 91.1)									
Above	10	2	5	2.0	8.7	2.7	7.8	4.3	1.4
Below	13	2	5	1.5	6.3	1.7	5.1	4.0	1.1
Above	12	2	11	1.7	7.1	2.1	5.7	4.6	1.3
Below	9	2	11	.9	4.2	1.4	3.1	3.0	1.0
Grade 5A (Mean EQ, 95.5)									
Above	8	2	5	− .9	7.5	2.6	6.6	3.5	1.2
Below	8	2	5	− .1	4.1	1.5	3.4	2.4	.8
Institution B									
Grades 4 to 6 (Mean EQ's Range from 89.3 to 95.9)									
Above	15	2	5	.7	7.9	2.0	6.8	4.1	1.5
Below	17	2	5	.1	6.6	1.6	5.1	4.2	1.0
Above	15	3	0	3.7	7.6	2.0	6.9	4.9	1.3
Below	17	3	0	3.7	6.4	1.5	6.0	4.2	1.0

Mental Development as Related to Gain or Loss in Educational Achievement

In this section changes in IQ were studied in relation to changes in EQ. The correlation technique was used for changes over two intervals of residence: two years, five months and two years, eleven months. The results are as follows:

Interval of Residence	Correlation
Two years, five months	.01 ± .06
Two years, eleven months	.23 ± .06

In neither case is any significant relationship shown. As measured by the Kuhlmann-Anderson group tests of intelligence and the Unit Scales of Attainment, changes in mental development have no direct relationship to changes in educational development over the intervals studied.

Mental Development as Related to Initial Level of School Marks

Schools marks are the standards of educational achievement meaningful to a child in the ordinary school situation. Not only are they indicators of attainment, but also they represent to the child the demands of the school. When report cards are issued, the child is faced with a judgment of success or failure in relation to the achievement of others, what others expect of him, and his own goals. Thus, on the basis of a belief that some relationship exists between mental development and school marks, analyses were made of change in IQ as related to a child's grade-point average in the major studies of his curriculum. The average grades for the first semester's work for the interval of residence being studied were used as the initial achievement level. Numerically *A*'s were given four points credit, *B*'s three, *C*'s two, *D*'s one, and *F*'s none.

In Table 14, changes in IQ have been related to initial grade-point levels for children in both Institutions A and B. It can be seen that none of the mean changes in IQ regarding sign are reliable and that no significant differences are present between the achievement levels for the same or differing intervals of residence. A slight trend may be present for IQ's to increase with grade-point level, if consistency at all intervals carries any weight. There are definite trends toward increase in average change with increase in achievement. At Institution A the differences between the lower and higher levels of the series are significant.

These trends are evident also in Table 15, where the extreme cases have been studied. Those below 2.0 grade-points are, for Institution A, lower than those above 3.0 grade-points, both for absolute change and change regarding sign. The amount of change for the lower group is unusually small.

Thus it would appear that those with the higher levels of achievement, as seen in teacher's marks, are probably receiving relatively

Table 14
Change in IQ in Relation to the Initial Level of Achievement as Seen in the Average of School Marks in Two Institutions for Dependent Children According to Interval of Residence

Initial Grade Point Level	Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
Institution A							
2 Years, 5 Months Interval							
.5 to 1.4	9	−1.1	2.9	1.0	2.9	1.1	.4
1.5 to 2.4	41	− .5	7.2	1.1	5.4	4.7	.7
2.5 to 3.4	61	.1	7.3	.9	6.0	4.1	.5
2 Years, 11 Months Interval							
.5 to 1.4	6	− .2	3.2	1.3	2.8	1.6	.6
1.5 to 2.4	28	.5	6.7	1.3	4.8	4.7	.9
2.5 to 3.4	48	2.0	8.2	1.2	6.6	5.3	.8
Institution B							
2 Years, 5 Months Interval							
.5 to 1.4	12	−3.2	6.7	1.9	5.8	4.6	1.3
1.5 to 2.4	32	.3	5.8	1.0	5.0	3.0	.5
2 Years, 11 Months Interval							
.5 to 1.4	10	1.4	4.6	1.5	4.0	2.7	.9
1.5 to 2.4	31	2.4	7.2	1.3	6.1	4.5	.8

more stimulation to mental development than those in the lower levels. Likewise, the upper group shows greater variability in IQ. They are perhaps more flexible and open to stimulating influences. Those whose achievement is poor, on the other hand, have lost faith in their ability to attain the goals that have been set for them. Continual performance at a mediocre level of achievement is not stimulating, but rather a reinforcement of routine and habit.

Mental Development as Related to School Failure

The data presented in Table 16 represent an attempt to answer the problem of the influence of school failures on mental develop-

Table 15

Change in IQ of Children Whose Initial School Marks Average Below *C* Compared with Those Whose Marks Average Above *B* According to Interval of Residence in Two Institutions for Dependent Children

Initial Grade Point Level	Children	Net Changes in IQ			Changes in IQ Disregarding Sign			IQ at Beginning of Interval	
		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation
Institution A									
2 Years, 5 Months Interval									
Below 2.0, (C)	22	−1.6	5.4	1.2	4.4	3.6	.8	88.4	9.8
Above 3.0, (B)	28	− .8	7.1	1.4	5.8	4.3	.8	98.8	11.9
2 Years, 11 Months Interval									
Below 2.0, (C)	8	1.0	2.2	.8	2.0	1.4	.5		
Above 3.0, (B)	23	2.9	6.5	1.4	6.0	3.8	.8		
Institution B									
2 Years, 5 Months Interval									
Below 2.0, (C)	32	−1.2	6.2	1.1	5.2	3.6	.6	85.5	10.6
2 Years, 11 Months Interval									
Below 2.0, (C)	26	2.5	5.6	1.1	5.2	3.2	.6		

ment. The cases used are all from Institution A. Separate analyses are based on the two intervals of residence. In each case individuals have been matched within three points on IQ when the period of residence was the same. Children who have progressed normally in school have been paired with (1) those having one failure, (2) those having two or more failures, and (3) those having two or more failures at same semester level. (Promotions are made semi-annually.)

It is evident that a tendency is present in all but one comparison for the children who have progressed normally to show smaller losses (or more gains) than the failing groups. Between none of the paired groups, however, are the differences statistically sig-

nificant or the gains or losses in IQ reliable. The data are inconclusive as to the influence of school failure on mental development.

Table 16
Change in IQ of Dependent Children in Institution A as Related to School Failure According to Interval of Residence

School Failure	Children	Net Changes in IQ			Changes in IQ Disregarding Sign		
		Mean	Standard Deviation	Standard Error of Mean	Mean	Standard Deviation	Standard Error of Mean
2 Years, 5 Months Interval							
Not failing	30	.4	7.0	1.3	5.4	4.4	.8
Failing once	30	.7	8.7	1.6	6.9	5.4	1.0
Not failing	37	1.0	7.1	1.2	5.4	4.6	.8
Failing twice	37	−2.2	6.2	1.0	5.4	3.8	.6
Not failing	28	2.4	5.9	1.1	4.9	4.0	.8
Failing twice in same semester level	28	−1.6	5.9	1.1	5.3	3.2	.6
2 Years, 11 Months Interval							
Not failing	23	2.2	7.2	1.5	6.0	4.5	.9
Failing once	23	1.0	6.9	1.4	5.7	4.0	.8
Not failing	23	2.2	7.2	1.5	6.0	4.5	.9
Failing twice	23	− .4	6.7	1.4	5.1	4.3	.9
Not failing	23	1.7	7.7	1.6	6.2	4.9	1.0
Failing twice in same semester level	23	− .2	6.5	1.4	4.8	4.4	.9

Summary

In this chapter the mental development of children in two homes for dependents has been studied in relation to the child's intitial status or change in relative position in educational achievement.

No studies are available which have investigated change in IQ in relation to the child's relative educational achievement among his associates. Numerous studies have shown that correlations between measures of intelligence and achievement range from .26 to .84, depending on the tests used, grade, IQ level of the child, and degree of efficiency of motivation. Other studies point out the leveling effect taking place in achievement in relation to the level

of the group. In a few studies it has been shown that when changes are made in pupil classification and in instruction, tending to cause students to work up to maximum capacity, the correlation between intelligence and achievement is decidedly increased.

The data for this chapter were based on the results of administering the Kuhlmann-Anderson group test of intelligence in conjunction with the Unit Scales of Attainment to 415 children in two state homes for dependents. Intervals between tests were two years, five months and two years, eleven months.

The findings may be summarized as follows:

1. When change in IQ is studied in relation to initial EQ level, no significant gains or losses in IQ are indicated. Mean changes show a slight tendency to increase with successively higher EQ levels, but the differences between levels are not statistically significant.

2. No significant differences were found between those above and those below their grade level in initial achievement. Mean change appears to be smaller for those below their grade level, although for individual grades these differences are not significant.

3. With the tests used and over the intervals studied, no direct relationships were found between gain or loss in educational achievement and gain or loss in intelligence.

4. When change in IQ is studied in relation to initial educational status as indicated by averages of school marks, no significant differences were found between the achievement levels for the intervals of residence studied. A slight trend was seen for IQ's to increase consistently, with grade-point levels, although individual means were unreliable. A definite trend is apparent for mean changes disregarding direction to increase with levels of achievement. The amount of change in the lower achievement levels is comparatively small.

5. On the basis of comparisons of matched groups, a tendency is present for children who have progressed normally in school to show smaller losses (or more gains) than those with failures in their records. Between none of the groups compared, however, are the differences statistically significant or the mean gains or losses reliable.

Thus, so far as significant relationships between mental development and certain factors of educational status and achievement are concerned, no conclusive evidence has been revealed.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study aims to investigate the mental development of children (1) in relation to residence in institutional environments, where the individual has remained in the same general environment or has shifted from an environment designed for children of one mental level to another primarily for individuals of a different mental level, and (2) in relation to individual placement in educational achievement within an institutional environment. Stated in terms of more specific problems for investigation, these purposes are:

1. To what extent is mental development of individuals remaining in the same institutional environment related to the general mental level of the group, the age of the child, and the length of residence in the institution?
2. What differences in these relationships are seen in environments of differing mental levels?
3. Where there has been a major shift of environment from an institution designed for children of one mental level to another primarily for individuals of a different mental level, do individuals tend to follow the pattern set by the mental level of their associates in the new environment?
4. To what extent is mental development related to initial status or change in relative placement in educational achievement within an institutional environment?

The subjects for this investigation consist of children resident in four Iowa institutions: the Iowa Soldiers' Orphans' Home at Davenport, the State Juvenile Home at Toledo, the Institution for the Feeble-minded at Glenwood, and the Hospital for Epileptics and School for Feeble-minded at Woodward. The subjects on whom individual tests were obtained consist of all children who were resident in these institutions between an initial test and one or more retests. All children over sixteen years of age at the time of the initial test or retest were eliminated so as to make all intelligence quotients computed on the basis of actual life age. No colored children, epileptics, physical anomalies, or cases at the idiot and low imbecile levels were included. In all a total of 988 different children entered into the individual test analyses, whereas 415 children were involved in group mental and educational tests.

The Stanford or Kuhlmann Revisions of the Binet Scale were used for all individual tests, the Kuhlmann, however, being limited to use with children of mental ages under three years. The Kuhlmann-Anderson group test of mental ability has been given in conjunction with the Unit Scales of Attainment in grades three through eight at the two homes for dependents. All tests were administered by well-trained examiners.

The specific results and conclusions as applied to the children studied are:

1. In environments where the mental level is primarily that of the normal and dull-normal child, individuals classified as borderline and moron tend, as groups, to remain constant or to show slight gains, while those designated as normal or superior show consistent losses. A trend is indicated for losses to be dependent upon the extent of deviation from the average of the group. Variability of the IQ appears to increase with higher mental levels, with mean changes for different mental levels ranging from 5 to 17 points. These data tend to support the hypothesis that changes in mental development are relative to the mental level of the group.

2. Children residing in institutions for the feeble-minded show consistent losses at all IQ levels studied, but the numbers of cases at the various IQ levels are insufficient to indicate any trend of losses to increase progressively with higher mental levels.

3. No significant differences are found between gains or losses in IQ for subjects of different ages at comparable IQ levels.

4. A general trend of loss with institutional residence is indicated. In the homes for dependents, small losses tend to increase progressively during intervals of residence ranging from a year to three years, six months. As between adjacent six months intervals of residence in the same institution, the differences in change of IQ are not significant. Over long intervals of residence in the Glenwood institution (Institution X), individuals classed as borderline and high moron show large cumulative losses.

5. Age differences are found for varying intervals of residence for children in the orphanages. Children under four years of age appear to lose during residence in the Davenport orphanage (Institution A) for intervals ranging from a year to a year and six months. Older ages remain practically constant for differing intervals, and mean changes are smaller for the older subjects. No

differences for younger ages are evidenced among the feeble-minded subjects.

6. Younger children in the orphanages show a consistent progression of decreasing loss in IQ with age. From ages six to thirteen a trend of loss is indicated, but no single mean is reliable. The IQ's of older children remain fairly constant and show less variability than those of the younger children. Among the feeble-minded no significant age differences can be noted with the data at hand.

7. For the orphanage children a trend is indicated in each comparison for those above the mental level of their school grade to lose more or gain less than those below the mean. It is probable that the mean mental level of the institution greatly influences the grade level comparisons. The findings are consistent with the theory that the group level sets the pattern of mental development of its members.

8. When children are transferred from institutions designed for normal and dull-normal children to other institutions primarily for children at the feeble-minded level, mental development after transfer tends to follow the pattern set by the level of the new environment. Those classified at transfer as borderline and moron show consistent losses following transfer, whereas high imbeciles remain fairly constant. Younger children, over intervals less than three years following transfer, reveal a tendency to gain in IQ as compared to losses in the older ages. Greater variability of IQ is shown for the younger ages. No differences are apparent for transfers and nontransfers living in the same cottage. For similar mental levels and intervals of residence, transfers and nontransfers show no differences in mental development. In all, these results are in agreement with those of Kuhlmann and others, but are here interpreted as related to the average mental level of the environment.

9. For sixteen dull-normal and normal children transferred from institutions for the feeble-minded to the orphanages, mental development after transfer also follows the pattern set by the new environment. All children with IQ's of 93 and above show losses after transfer, while those with IQ's of 85 and below show gains. Gains or losses in IQ are seemingly more related to the mental level of these children than to age differences.

10. When individuals of the same age and mental level are compared in relation to similar periods of residence in environments of

differing mental level, significant differences in mental development are seen. In schools for the feeble-minded, individuals tend to show losses, while in the orphanages children of the same age and mental level remain fairly constant over comparable intervals. In the orphanages these children represent the lower mental levels, but in the institutions for the feeble-minded they are among the higher mental levels. It would appear that the differing mental levels of the two environments set different patterns of environmental stimulation.

11. In this investigation there is no conclusive evidence of any significant relationships between mental development and certain factors of educational status and achievement. Neither are significant gains or losses in IQ revealed when children are classified in relation to initial educational status, taken either on the basis of achievement test scores or school marks. A trend is evident, however, for mean changes in IQ to increase with successively higher achievement levels. Individuals above the level of their respective grades in achievement show no significantly greater gain or loss in IQ than those below the mean.

12. No direct relationships are found between gain or loss in educational achievement and gain or loss in intelligence. Correlations between these two variables give coefficients of $.23 \pm .06$ and $.01 \pm .06$.

13. On the basis of consistency, a trend may be present for children who have progressed normally in school to show smaller losses (or more gains) than those with failures during the same interval. Between none of the groups compared, however, are the differences statistically significant or the mean gains or losses reliable.

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